

Undergraduate Science Experiences
at Harvard College:
Findings from over 400 survey responses
submitted by students with varied
interests and abilities in the sciences

Academic Year
2008-2009

Follow-up study to the 2005-2006 report

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Introduction

Harvard is one of the most prolific and prestigious research institutions in the world. Therefore, it is no surprise that hundreds of undergraduate students choose to concentrate in the natural or applied sciences so that they can access cutting-edge research and interact with renowned professors. It was unclear, however, how well Harvard was doing in providing positive undergraduate science experiences to undergraduates. In order to remedy this, Vijay Yanamadala (Harvard '07) conducted a study in the 2005-2006 academic year called "Undergraduate Science Experiences at Harvard College."² Yanamadala interviewed 40 students from various science concentrations and at different stages of their undergraduate career about their overall science experiences in college and found a number of positive and negative themes. Good news included the fact that students in the sciences "describe[d] research as one of the most rewarding experiences of being at a place like Harvard" and these students "feel valued by Harvard, valued by society..."³

Unfortunately, there were many discouraging realizations that offset this good news:

"1. A large majority of undergraduates who have actively sought out research opportunities express frustration with the process...

2. A majority of students...interviewed pointed to [the] lack of encouragement they face – specifically, many say that not a single person at Harvard has EVER encouraged them to pursue scientific research early in their undergraduate career...

3. Not a single interviewee was able to identify a single program in ANY of the sciences in campus that encourages interdisciplinary interactions WITHIN the sciences..."⁴

This study was widely distributed among Harvard faculty and administrators and, to some extent, influenced curricular and programmatic changes to address these problems. These developments include: the integrative approach to first-year science courses, such as Life Sciences 1a/b and Physical Sciences 1/2/3; the division and specialization of the life science concentrations; the formation of the Harvard College Program for Research in Science and Engineering (PRISE)⁵ in Summer 2006; the expansion of funding opportunities, like the Harvard College Research Program (HCRP)⁶, for students conducting research in the summer – both domestically and internationally – as well as during the academic year; the creation of interdisciplinary student science organizations, like the Harvard College Undergraduate Research Association⁷; and the establishment of College-wide venues to present research, such as the Harvard and Boston

² Yanamadala, Vijay. "Undergraduate Science Experiences at Harvard College: Findings from 40 In-Depth One-on-One Interviews with Students of Varied Interests and Abilities in the Sciences. 2005-2006" Available:

http://harvardsabs.weebly.com/uploads/1/7/9/7/1797679/undergraduate_science_experiences_at_harvard_college.pdf

³ Ibid. p. 3

⁴ Ibid. p. 4

⁵ <http://priselink.harvard.edu>

⁶ <http://www.seo.harvard.edu/resprog/hcrp.html>

⁷ <http://www.hcura.org>

Undergraduate Research Symposia.⁸ All of these changes have been implemented during the last three years to a largely favorable reception. However, it is unclear if they have mitigated the problems uncovered in Yanamadala's study.

At the beginning of the present academic year, the Undergraduate Council (UC) formed a number of student-faculty advisory committees in three different FAS divisions: arts and humanities, social sciences, and science. The Dean of Science, Jeremy Bloxham, chairs the Student Advisory Board for Science (SABS) which consists of two of his colleagues and seven undergraduates from a range of scientific fields. More information about the SABS activities and composition may be found on the website, <http://www.harvardsabs.weebly.com>. In order to assess the current state of undergraduate science experiences at Harvard, the SABS decided to perform a follow-up study to the 2005-2006 report. Four members of the advisory board, (SG, KK, KM, RB) took charge of the data collection, analysis, and this written report.

Methods

Survey Design

The present survey was based off of the interview questions used in the 05-06 study.⁹ An effort was made not to change the questions unnecessarily because we wanted to be able to compare our results to those of the previous study. In order to ensure the survey was relevant, we distributed draft copies of the survey, with a request for comments and suggestions, to all of the Concentration Advisors as well as a number of other people involved with undergraduate science (e.g. Directors of PRISE and HCRP as well as Research Advisors). The survey questions underwent five (5) revisions based off of feedback from these administrators and professors. In its final version, the survey comprised 36 questions covering major undergraduate science issues, such as research opportunities and coursework. The survey can be found in entirety in Appendix B: SABS Survey.

Survey Distribution

The final version of the survey was then formatted and inputted into the Harvard iCommons Poll Tool. This tool was chosen over other online tools for two reasons: (1) the Poll Tool requires a Harvard PIN to take the survey and thus we could ensure that only Harvard students responded to the poll, and (2) the tool added credibility to the study so that students were more likely to take the survey. In order to ensure compliance with Harvard's Standing Committee on the Use of Human Subjects,¹⁰ the survey was sent to Senior Research Officer Jane Calhoun, who approved it and gave us permission to distribute it.

⁸ <http://hcs.harvard.edu/hurs> and <http://www.burs2009.org>

⁹ Yanamadala, p. 31-33

¹⁰ According to "Section 7.2.1 Categories of Research Permissible for Exemption" of the Committee's Policies and Procedures (http://www.fas.harvard.edu/~research/hum_sub/documents/Policies_and_Procedures.pdf, page 29), the present study is exempt from review because it is "Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (a) research on regular and special educational

The survey was published online from Friday, April 10, 2009 (12:01 am) to Sunday, April 26, 2009 (11:59 pm) so that students could log in any time at their convenience and answer the questions. E-mails from the Dean of Science, Jeremy Bloxham, were sent to all department heads, concentration advisors, and professors teaching large science classes requesting them to distribute the survey URL to their students. In addition, members of the student advisory board for science (SABS) publicized the survey on House lists and various science organization e-mail lists. We wanted to receive a large freshmen response because any changes that occur based off of the results of this study are more likely to affect these students. To that end, the survey was distributed to the entire Class of 2012 e-mail list.

The predominant reason for choosing an online survey-format was to maximize the number of responses. A limitation is the likelihood of response bias, in which students with the most extreme viewpoints are the ones who choose to take the survey. By having administrators and professors encourage their students to take the survey, we were able to achieve a very large sample size ($n > 400$) and therefore believe that response bias did not complicate our results too much.

Data Analysis

The iCommons Poll Tool automatically calculates the percent of students who answered each particular choice of each individual question, making overall data analysis relatively easy. The individual responses of all students, which are kept anonymous and confidential, were also provided so that the answers to the short response questions could be analyzed. Data were also divided into subcategories (female, male, freshmen, upperclassmen, and concentration) and analyzed in order to investigate similarities and discrepancies between certain demographics.

Results

Demographics

The total number of students who responded to the survey was 406, but this number varied for each individual question because all of the questions were not mandatory. Based on the Harvard College Handbook for Students 2008-2009, the number of declared science concentrators at any given time at Harvard is around 1200,¹¹ so we were able to poll about one-third of all the science concentrators. There were approximately an equal number of freshmen, sophomores and juniors who responded (~28% each, ~16% were seniors). More females responded than males (56% versus 44%). Students from all concentrations (with the exception of statistics) responded, the majority of whom were in molecular and cellular biology, which makes sense because biochemistry and MCB have traditionally been the largest science concentrations. When asked about career choices (“check all that apply”), slightly over 55% expressed an interest in a career related to medicine or health, 28 percent in applied science or engineering, and 21% in business.

instruction strategies, or (b) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.”

¹¹ Data collated from *Harvard College Handbook for Students 2008-2009*. Excel spreadsheet can be requested by e-mailing SG at sgaglani@fas.harvard.edu.

Research Experiences

The number of students who were at the time conducting or had previously conducted research during term time was almost exactly evenly split (50:50). Of those who had conducted research in a Harvard lab at some point, the plurality (47%) spend 6-10 hours in lab per week. Regarding research opportunities, over 80% agreed or strongly agreed that research opportunities are important to their science education; 60% agreed or strongly agreed that it is easy to find these research opportunities; 62% agreed or strongly agreed that there are many research opportunities available to them; and 47% agreed or strongly agreed that there is ample opportunity to present their research at Harvard. When asked whether anyone had encouraged them to pursue research at Harvard, slightly over 60% answered affirmatively. Regarding problems and frustrations with the research process, an encouraging 63% said that they did not have difficulty establishing or maintaining contact with a research professor; however, 15% said that they felt their work in the lab did not seem to serve an intellectual goal and 20% said they had problems finding funding for research opportunities

Academic Experiences

With regards to academic coursework, 74% agreed or strongly agreed that science courses are more competitive than non-science courses; while 86% agreed or strongly agreed that they collaborate with peers in their concentration classes while only 51% agreed or strongly agreed that they collaborate with peers in their non-concentration classes. About 41% of students spend 11-25 hours per week on their non-concentration classes, compared to 72% spend that amount of time on their concentration classes. Encouragingly, 80% of students agreed or strongly agreed when asked if they were satisfied with Harvard from an academic perspective and 74% agreed or strongly agreed that they were satisfied with their concentration from an academic perspective. 76% believe that Harvard devotes enough resources to their concentration, and 62% say that they know at least one faculty member (within their concentration) reasonably well and who they feel cares about them.

Discussion and Conclusion

Based on the overall results of the survey, there is much to be encouraged about. This is especially true when these results are compared to the conclusions from the 2005-2006 study. Though the study designs and sample sizes were different, we can still compare the overall conclusions from the previous study with those from the current study. We will take each conclusion in turn, and conclude with additional analyses and general suggestions:

“1. A large majority of undergraduates who have actively sought out research opportunities express frustration with the process. The primary frustration appears to be lack of faculty responsiveness. For example, e-mails to professors asking whether it might be possible to work in a lab, or to become a research assistant, often go entirely unanswered – Entirely Ignored.” Yanamadala found that the majority of the students he interviewed had faced these communication problems. In the present study, we found that only 36% of undergraduates had

this difficulty in establishing or maintaining contact with a research professor. Though still high, it represents an improvement over the last three years. What could have resulted in this change in faculty responsiveness? One potential reason is that research advisors, like Ann Georgi, are teaching undergraduates how best to approach research professors via e-mail. For example, the Life Sciences webpage advises freshmen “Your email [to faculty] should be targeted to specific faculty and not be generic. Since you will have already done the background reading from the lab, you can mention their research specifically (and even cite the papers you may have read) and say why this work is of particular interest to you.”¹²

A related problem is the ability of Harvard offices to help students with seeking out external funding and research opportunities. Although 50% of respondents reported seeking research opportunities outside Harvard’s walls, 44% claimed that Harvard is unhelpful in such endeavors.

2. A majority of students...interviewed pointed to [the] lack of encouragement they face – specifically, many say that not a single person at Harvard has EVER encouraged them to pursue scientific research early in their undergraduate career...

In the present study, we found that this is no longer the case. Indeed, the majority of students (61%) said that they had been encouraged to pursue research at some point during their undergraduate career. When asked to list who specifically encouraged them, the names of many research and faculty advisors came up, as well as peers from science organizations like the Harvard College Undergraduate Research Association (which has its own Big Sib-Little Sib Advising Program). While 61% is still not ideal, it represents a step in the right direction. Related is the problem of building relations between science students and their professors. One of the questions on the survey asked whether the student can name at least one faculty member within their concentration who “knows them reasonably well” and “cares about them”. While a high 36% of freshmen agreed, only 62% of students overall gave a positive response. In fact, 11% of seniors responded “no” to this question.

3. Not a single interviewee was able to identify a single program in ANY of the sciences in campus that encourages interdisciplinary interactions WITHIN the sciences... Many students feel that this type of interaction may greatly benefit them”

The Program for Research in Science and Engineering (PRISE) epitomizes interdisciplinary interaction among undergraduates from different scientific backgrounds. Almost 37% of students have participated in summer research programs like PRISE. Also, there are now interdisciplinary student science organizations such as HCURA, which hosts the annual Harvard Undergraduate Research Symposium. In less than three years, close to 23% of students have either presented or attended HURS.

4. Gender, class year, and concentration comparisons

We compared male and female responses as well as freshmen and upperclassmen responses to determine what similarities and differences exist within these subcategories of gender and class year. Table 1 in Appendix A provides a comprehensive comparison of female and male responses. It is encouraging that there are few differences between the responses, especially on

¹² <http://www.lifesciences.fas.harvard.edu/icb/icb.do?keyword=k5526&pageid=icb.page49199>

key measures like whether anyone encouraged them to pursue research and if they know a faculty member reasonably well. However, there are some obvious differences in areas such as career and concentration choices as well as in skill development preferences (e.g. interestingly, a much higher percentage of female respondents believe ethics of science to be important to their futures; similarly, a higher percentage of female respondents who initially thought they were going to concentrate in a scientific field decided to concentrate in a non-scientific field).

Table 2 in the appendix provides an easy way to compare freshmen, sophomores, juniors, and seniors on certain key measures. For example, it makes sense that there is an increasing percentage of students conducting research as one goes from freshman to senior year; similarly, an increasing number of student report knowing a faculty member whom they feel cares about them as we progress from freshman to senior year. Regarding freshmen versus upperclassmen (sophomore, juniors, and seniors), responses from the two groups appear surprisingly similar, almost raising the question to what extent Harvard is successful in changing the aspirations and attitudes of its students. Of course, it is possible that the same number of students changes their mind each way. The number of students participating in research increases after Freshman year, as does the perceived ease of finding a lab. Slightly less than a half of Freshmen are encouraged to pursue research. Sources of information on research are similar. It is interesting that close to 40% of Freshmen seek information from concentration advisors. Only 39% of Freshmen know a professor in their concentration reasonably well, which is not surprising. Much more worrisome is the fact that only 74% of Upperclassmen know a professor “reasonably well”.

The remainder of Appendix A is devoted to concentration-specific analyses that provide tangible comments for improving students’ experiences. Also, Table 3 provides an easy way to make cross-concentration comparisons. It should be emphasized that some of the concentrations have low response rates and should be analyzed with this in mind.

5. Academic offerings and general suggestions

In order to present some of the further possible improvements in the science curricula at Harvard, we decided to report the sentiments most commonly expressed in our open-ended questions. These included:

- more opportunities for summer research abroad
- stronger links between problem sets for classes and actual research problems
- choice between “multidisciplinary” classes like the Physical Sciences series and more basic offerings
- expanding the tutorial format to concentrations that do not have it
- greater place for science in the Core/General Education curriculum.

Our survey revealed a particularly high disparity between the way in which students view the importance of certain skills and teaching of those skills at Harvard. Although 74% of respondents thought that knowledge of public policy related to science is important for their future, only 33% agreed that Harvard successfully teaches this skill. When searched for “public policy”, the course catalog for the current academic year reported only offerings in Environmental Science and Public Policy, as well as one class in Computer Science. Similarly,

while 71% of respondents see a need for knowledge of ethics of science, only 26% think that Harvard offers good preparation in this area. Not surprisingly, the number of classes with relevance to ethics and science offered in the year 2009/2010 was five (5), two of which are restricted to freshmen, with the total enrollment of 154 in the year 2008/2009 (excluding a Science A Core Curriculum class). Scientific writing and oral communication were highly valued by 88% and 99% of the respondents, respectively. However, only 57% and 52%, respectively, thought that Harvard successfully teaches those skills. A course catalog search for “communication” and “communicating” reveals three (3) classes, one restricted to advanced graduate students and one restricted to freshmen. It is our hope that the General Education Curriculum will enable science concentrators to develop these skills that they view as important yet fail to learn through classes at Harvard.

The above discussion only represents a small, but critical, subset of conclusions that may be drawn from our study. Much future work needs to be done to glean more information regarding experiences of students, especially those with specific demographics (e.g. freshmen, males and females, certain concentrations, etc).¹³ Indeed, we invite the reader to peruse Tables 1, 2, and 3 so that the he or she may find comparisons or trends that may be of specific interest to him or her. Overall the results are encouraging and hopefully the trend of improvement from the 2005-2006 level will continue. Despite potential downward pressure on the budget, it is crucial that Harvard continues to invest in collegiate research opportunities since they are so integral to the science experiences of undergraduates here.

Limitations

There are a number of limitations to the present study. As with most survey-based studies, there is response bias since people who take the time to complete the questionnaire often have the most polarized views, both positive and negative. The sample is not completely representative of the overall undergraduate population given that 56% of the respondents were female and 44% male. However, we hope that a representative cross-section of the undergraduate science concentrator population was surveyed given the large number of students who completed the poll. Some of our concentration-specific analyses are severely limited by the low response rate. For example, no Statistics concentrators responded to the poll. Furthermore, we decided not to calculate and include statistical measures of significance because the nature of this study does not clearly warrant such statistical methods. Our purpose was to follow up on the 2005-2006 study and build upon it by surveying more students using a semi-quantitative approach. By including the raw data and analyses, we hope that the reader will use his or her discretion to determine how best to use this report. Finally, we did not include any questions regarding teaching in the questionnaire. Since many students serve as Teaching Fellows, Course Assistants and tutors in science, we suggest including questions related to teaching experiences in any future studies of this kind.

¹³ If the reader is interested in the raw data files, he or she may e-mail the primary author SG (Class of 2010) at sgaglani@fas.harvard.edu or shiv.gaglani@gmail.com.

Acknowledgments

The authors would like to express their gratitude to a number of people. First of all, this study would not have been possible without the aid of fellow SABS member, Raelyn Lincoln. She was instrumental in distributing the survey so that we had a great number of responses. Thanks to all of the concentration advisors and professors who reviewed the survey and distributed it to their students. A special thanks to Gregory Llacer, the Director of the PRISE, for helping revise the survey and facilitate its dissemination via the iCommons Poll Tool. Thanks also to Ann Georgi, Research Advisor for the Life Sciences, who helped analyze the results at the end of the survey. The authors would finally like to thank the entire Student Advisory Board for Science for their company and advice regarding the survey, as well as the Dean of Science Jeremy Bloxham for chairing the SABS and supervising SG's Independent Study based on the survey results.

Appendix A: Data

Overall Responses

Before we look at the research, academic, and general science experiences of these students, we will discuss their demographics.

Demographics

N = 406; 228 female, 177 male; 116 class of 2012, 107 class of 2011, 114 class of 2010, 68 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 47% are pursuing a secondary field. 55% of respondents are considering going into a career in medicine or healthcare, 34% are considering a career in life sciences, 28% are considering a career in applied science or engineering, 23% are considering a career in the physical sciences, and 21% are considering a career in business.

Research Experiences

Research opportunities

38% of respondents came to the college with previous research experience, while 49% have done research while at Harvard. 20% of respondents spend 1-5 hours per week on research, 47% spend 6-10 hours per week on research, 22% spend 11-15 hours per week on research, 7% spend 16-20 hours per week on research, and 4% spend 21-25 hours per week. 81% of respondents believe that research opportunities are important for science education.

60% of respondents think that it is easy to find research opportunities at Harvard. 62% believe that there are many research opportunities available, while 13% disagree. 47% believe that their education is better enhanced in the laboratory than the classroom, while 13% disagree. 47% believe that there is ample opportunity to present research, while 7% disagree. 61% were encouraged to pursue research at Harvard.

36% have pursued summer research. 56% of respondents look to HCRP/SEO for information about research opportunities and funding, 54% look to their concentration advisors, 45% look to e-mail listservs, and 35% look to proctors, tutors, and advisors. 50% of respondents have pursued science opportunities outside Harvard, 50% have found Harvard helpful in obtaining those opportunities, and 65% have considering combining their research with an international experience.

23% of respondents presented research at Harvard and 8% of respondents have been published in an undergraduate science journal.

Problems with research

36% of students had trouble establishing and/or maintaining contact with a research professor and 15% of students had issues with working in a laboratory without a clear intellectual goal. 20% of students had problems finding funding.

Academic Experiences

Collaboration and competition

74% believe that science classes are more competitive than non-science ones, while 10% disagree. 86% of respondents agree that they collaborate with peers in their concentration, while 51% agree that they do with non-concentration peers. 27% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	87%	55%	4%	19%
Oral Communication	97%	51%	0%	25%
Knowledge of current scientific literature	84%	59%	4%	16%
Knowledge of public policy	81%	31%	7%	35%
Ethics of science	74%	26%	8%	34%
Knowledge of other scientific fields	68%	63%	4%	10%

General Experiences

Satisfaction with concentration and Harvard as a whole

74% of respondents are academically satisfied with their concentration, while 71% are personally satisfied with it. 80% are academically satisfied with Harvard as a whole, while 73% are personally satisfied with it.

Concentration resources

62% of respondents have at least one faculty member in the concentration who they know reasonably well and cares about them and 76% feel that Harvard directs enough resources to the concentration.

Table 1: Comparison between Male and Female Respondents

All decimals represent the fraction of either males or females that answered in the affirmative for that category or question. For example, the .63 under “Female” for “Medicine or Healthcare” signifies that 63% of female respondents marked Medicine or Healthcare as a potential career choice. Blue cells demarcate categories of analysis and green cells highlight discrepancies of greater than 5% between female and male respondents.

	Female	Male
Demographics		
Sample size	229	177
Class of 2009 (seniors)	.16	.18
Class of 2010 (juniors)	.30	.25
Class of 2011 (sophomores)	.22	.32
Class of 2012 (freshmen)	.32	.24
Pursuing a Secondary Field	.46	.48
Potential Career Choices (fractions add up to more than one because students could pick all potential career choices)		
Applied Science or Engineering	.24	.33
Business	.16	.27
Consulting or Finance	.12	.24
Government	.11	.11
Law	.08	.16
Life Sciences	.34	.35
Medicine or Healthcare	.63	.45
Physical Sciences	.17	.31
Other	.20	.15
Concentration Choices		
Initially thought science, decided on science	.70	.84
Initially thought science, decided on non-science	.10	.02
Initially thought non-science, decided on science	.06	.10
Initially thought non-science, decided on non-science	.06	.02
Concentration not decided yet	.07	.02
Applied Mathematics	.04	.06
Astronomy	.01	.03
Biochemistry	.01	.03
Biology	.02	.01
Chemical and Physical Biology	.05	.06
Chemistry	.07	.13
Chemistry and Physics	.01	.02
Computer Science	.02	.03
Earth and Planetary Science	.03	.02
Engineering Sciences (AB)	.04	.02
Engineering Sciences (SB)	.04	.04
Human Evolutionary Biology	.04	.02
Joint Concentration	.00	.05

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Mathematics	.01	.08
Molecular and Cellular Biology	.15	.12
Neurobiology	.14	.06
No response	.12	.02
Organismic and Evolutionary Biology	.06	.04
Physics	.06	.11
Research Experiences		
Conducted/Conducting Labwork outside of Class	.47	.53
Spends 1-5 hrs/week in lab	.16	.24
Spends 6-10 hrs/week in lab	.49	.44
Spends 11-15 hrs/week in lab	.24	.19
Spends 16-20 hrs/week in lab	.06	.09
Spends 21-25 hrs/week in lab	.06	.02
Believes research opportunities are important	.82	.81
Believes research opportunities are easy to find	.58	.62
Believes there are many research opportunities	.62	.62
Believes understanding of science is better enhanced in lab than in classroom	.46	.49
Believes there are ample opportunities to present research	.48	.46
Presented Research at Harvard (e.g. HURS)	.24	.21
Been Encouraged to Pursue Research	.61	.62
<i>Problems with Research</i>		
Difficulty Communicating with Professor	.39	.32
Unstimulating Lab Work	.14	.16
Problems Finding Funding	.21	.20
<i>Research outside of Harvard</i>		
Engaged in science research at other Harvard schools (e.g. med)	.21	.24
Sought scientific research opportunities outside of Harvard	.47	.54
Believes Harvard is helpful in arranging outside research opportunities	.47	.55
Considered combining research with an international experience	.66	.63
Academic Experiences		
Believes Harvard devotes enough resources to concentration	.73	.80
Believes science courses more competitive than non-science	.77	.70
Collaborates with peers in science courses	.87	.85
Collaborates with peers in non-science courses	.50	.52
<i>Believes that the following skills are important to future</i>		
Scientific Writing	.88	.87
Oral Communication	.97	.97
Knowledge of Current Scientific Literature	.86	.81
Knowledge of Public Policy	.77	.70
Ethics of Science	.75	.60
Knowledge of other Scientific Fields	.78	.85
<i>Believes that Harvard prepares one with the skills</i>		

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Scientific Writing	.55	.55
Oral Communication	.55	.46
Knowledge of Current Scientific Literature	.57	.61
Knowledge of Public Policy	.30	.32
Ethics of Science	.27	.25
Knowledge of other Scientific Fields	.60	.67
General Experiences		
Satisfied with Harvard from an academic perspective	.81	.80
Satisfied with Harvard from a personal perspective	.72	.74
Satisfied with concentration from an academic perspective	.72	.76
Satisfied with concentration from a personal perspective	.67	.75
Knows at least one faculty member who he or she knows reasonably well and feels cares about him or her	.62	.62

Female Respondents

The data for all the respondents who identified their gender as “Female” were analyzed separately across concentrations.

Demographics

N = 228; 32% class of 2012, 22% class of 2011, 30% class of 2010, 16% class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 46% are pursuing a secondary field. A majority (63%) are considering going into medicine or healthcare; 34% are also considering the life sciences.

Research Experiences

Research opportunities

40% of the respondents came to the College having previously done research. 47% have done research while attending the College, through a variety of venues. A plurality (49%) spend 6-10 hours on lab research; 36% spend 11 hours or more. 82% of respondents believe that research opportunities are important for science education, while 7% disagree.¹⁴

58% of respondents think that it is easy to find research opportunities at Harvard, while 15% disagree. 62% think that there are many research opportunities at Harvard, and 14% disagree. 46% think that their education is better enhanced in the laboratory than the classroom, while 13% disagree. 61% were encouraged to pursue research by professors, advisers, peers and teaching fellows (especially in Life Sciences 1a). Of repeated mention: Anne Georgi (7), Richard Losick (5), Greg Tucci (4).

37% have pursued summer research. The largest majority, 59% of respondents, look to HCRP/SEO for information about research opportunities and funding. 55% look to concentration advisers and 54% use email listservs. 47% of respondents have pursued science opportunities outside Harvard, 47% have found Harvard helpful in obtaining those opportunities, and 66% have considering combining their research with an international experience. Only 21% have engaged in research at other Harvard schools.

Only 24% of respondents presented research at Harvard, mainly through HURS, BURS, miscellaneous symposia, PRISE and department-related talks. 22% attended student science activities (primarily HURS, BURS, THURJ) and 8% published in an undergraduate science journal (primarily Harvard Brain, Harvard Science Review, THURJ).

¹⁴ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

Problems with research

39% of students had trouble establishing and/or maintaining contact with a research professor. 14% had issues with working in a laboratory without a clear intellectual goal, and 21% had trouble finding funding.

Academic Experiences

Collaboration and competition

77% believe that science classes are more competitive than non-science ones, while 10% disagree. 87% of respondents agree that they collaborate with peers in their concentration, while only 50% agree that they do with non-concentration peers. 4% do not collaborate with concentration peers and 26% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	88%	55%	3%	19%
Oral Communication	97%	55%	0%	22%
Knowledge of current scientific literature	86%	57%	3%	14%
Knowledge of public policy	77%	30%	7%	32%
Ethics of science	75%	27%	4%	31%
Knowledge of other scientific fields	78%	60%	3%	11%

General Experiences

Satisfaction with concentration and Harvard as a whole

72% of respondents are academically satisfied with their concentration, while 67% are personally satisfied with it. 12% are not academically satisfied and 13% are not personally

satisfied. In contrast, 81% are academically satisfied with Harvard as a whole, while 10% are not. 72% are personally satisfied with Harvard, and 13% are not.

Concentration resources

62% of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. 73% feel that Harvard directs enough resources to the concentration.

Male Respondents

The data for all the respondents who identified their gender as “Male” were analyzed separately across concentrations.

Demographics

N=177. 24% (43) Class of 2012, 32% (57) Class of 2011, 25% (45) Class of 2010, 18% (32) Class of 2009.

Concentrations, Secondaries, and Career Interests

Around a half of the students (85; 48%) said they were pursuing a secondary field, including almost any discipline from the sciences, social sciences and humanities.

The declared future career choices include Medicine (45%), Life Sciences (35%), Applied Science/Engineering (33%), Business (27%), Consulting/Finance (24%)¹⁵. The 15% who declared an interest in an “Other” career were most often interested in Education and Academia. 84% declared coming to Harvard with intent to study science, while 10% did not plan to study science and changed their mind here. Three students (2%) who wanted to study science, but changed to a non-scientific field did because of “lack of good TFs in the sciences”, “mean-spirited atmosphere” and “excessive competition”.

Research Experiences

Research opportunities

36% of the male respondents came to the College having previously done research. 53% have conducted research not for course credit at the college.

Almost a half (44%) of the respondents conducting research does it for 6-10 hours per week. 24% research for 1-5 hours/week, 19% for 10-15 hours/week and 9% for 15-20 hours/week. No male students reported working on research for more than 25 hours in a week.

Although most male students think that there ample and easy to find opportunities for research at Harvard (62% agree, 12% disagree), only 46% think that there enough opportunities to present the results (7% disagree). 81% of all male respondents believe that research opportunities are important for their science education, while 8% disagree.¹⁶ A half (49%) thinks that research is actually more important to their scientific education than class work. Only 14% disagree with this statement.

62% of the male respondents were encouraged to pursue research. The sources of encouragement vary widely, but most responses mention Freshman Advisors, Concentration Advisors and Professors.

¹⁵ The percentages do not add to a hundred as the questionnaire allowed multiple answers.

¹⁶ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

24% of the males who answered the survey used research opportunities at Harvard outside of the Cambridge campus. 54% sought research opportunities outside of Harvard and 63% were interested in combining research with an international experience. However, only 55% found Harvard helpful with making such arrangements. The main sources of information about research and funding for it have been concentration advisors (54%) and the Harvard College Research program/Student Employment Office database (51%). Email lists (33%), other advisors (31%) and the CARAT database (24%) were other significant sources of this information for male respondents.

Only 21% of male respondents have actually presented their results and attended student science events at Harvard. 8% have published in student science journals. Furthermore, only 30% attended a research-related event at the college (e.g. the Undergraduate Research Symposium).

Problems with research

32% of respondents experienced problems with funding, 16% with intellectually un-stimulating work and 20% had problems communicating with mentors.

Academic Experiences

Collaboration and competition

70% believe that science classes are more competitive than non-science ones, while only 11% disagree. More respondents report collaboration with peers in concentration classes (85%) than in non-concentration ones (52%). 7% do not collaborate with peers in the sciences and 29% do not cooperate in other fields.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	87%	55%	6%	19%
Oral Communication	97%	46%	1%	28%
Knowledge of current scientific literature	81%	61%	7%	18%
Knowledge of public policy	70%	32%	8%	38%

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Ethics of science	60%	25%	14%	40%
Knowledge of other scientific fields	85%	67%	6%	9%

General Experiences

Satisfaction with concentration and Harvard as a whole

76% of male respondents were academically and personally satisfied with their respective concentrations. 10% expressed lack of satisfaction. Similarly, 75% are personally satisfied with their concentrations, while 11% are not.

Harvard is rated as academically satisfying by 80%. 74% declared being personally satisfied with Harvard overall. 14% find their life at the university personally unsatisfying, while 10% do not enjoy it academically.

Concentration resources

Only 62% of male respondents know a faculty member from their concentration reasonably well. 80% feel that Harvard directs enough resources to their concentrations.

Table 2: Comparison between Class Years

All decimals represent the fraction of freshmen, sophomores, juniors, and seniors that answered in the affirmative for that category or question. For example: the .27 under Freshmen for the category of “Conducted/Conducting Labwork outside of Class” means that 27% of these Freshmen have engaged in collegiate research. It is important to note that these are four separate classes; though they have demographic similarities, there are also differences.

	Overall	Freshmen (2012)	Sophomores (2011)	Juniors (2010)	Seniors (2009)
Demographics					
Sample size	406	116	107	114	68
Female	.56	.63	.47	.61	.53
Male	.44	.37	.53	.39	.47
Pursuing a Secondary Field	.47	.49	.48	.45	.46
Potential Career Choices (fractions add up to more than one because students could pick all potential career choices)					
Applied Science or Engineering	.28	.27	.32	.26	.26
Business	.21	.22	.26	.16	.18
Consulting or Finance	.17	.17	.21	.11	.19
Government	.11	.10	.11	.12	.09
Law	.12	.11	.15	.11	.10
Life Sciences	.34	.41	.43	.26	.22
Medicine or Healthcare	.55	.59	.59	.55	.43
Physical Sciences	.23	.25	.25	.19	.19
Other	.18	.15	.17	.22	.19
Concentration Choices					
Initially thought science, decided on science	.76	.77	.80	.72	.76
Initially thought science, decided on non-science	.07	.04	.06	.11	.04
Initially thought non-science, decided on science	.08	.01	.10	.10	.13
Initially thought non-science, decided on non-science	.04	.03	.03	.06	.06
Concentration not decided yet	.04	.15	.01	.00	.00
Applied Mathematics	.05	.01	.08	.05	.06
Astronomy	.02	.04	.00	.03	.00
Biochemistry	.02	.00	.00	.01	.10
Biology	.01	.02	.00	.00	.06
Chemical and Physical Biology	.05	.05	.07	.04	.04
Chemistry	.10	.08	.09	.13	.09
Chemistry and Physics	.01	.01	.04	.00	.00
Computer Science	.03	.02	.03	.04	.03
Earth and Planetary Science	.02	.00	.01	.03	.07

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Engineering Sciences (AB)	.03	.03	.03	.04	.03
Engineering Sciences (SB)	.04	.06	.05	.03	.03
Human Evolutionary Biology	.03	.03	.02	.05	.04
Joint Concentration	.02	.03	.02	.03	.01
Mathematics	.04	.03	.03	.05	.09
Molecular and Cellular Biology	.14	.15	.21	.11	.06
Neurobiology	.11	.13	.10	.11	.06
No response	.08	.06	.07	.12	.04
Organismic and Evolutionary Biology	.05	.10	.05	.00	.04
Other	.05	.06	.02	.07	.07
Physics	.08	.09	.08	.07	.06
Research Experiences					
Conducted/Conducting Labwork outside of Class	.49	.27	.44	.66	.68
Spends 1-5 hrs/week in lab	.20	.29	.30	.13	.13
Spends 6-10 hrs/week in lab	.47	.48	.47	.43	.50
Spends 11-15 hrs/week in lab	.22	.06	.13	.31	.28
Spends 16-20 hrs/week in lab	.07	.10	.06	.08	.04
Spends 21-25 hrs/week in lab	.04	.00	.00	.05	.09
Believes research opportunities are important	.81	.88	.83	.75	.76
Believes research opportunities are easy to find	.60	.51	.65	.55	.74
Believes there are many research opportunities	.62	.59	.60	.61	.74
Believes understanding of science is better enhanced in lab than in classroom	.47	.42	.43	.49	.59
Believes there are ample opportunities to present research	.47	.41	.51	.42	.57
Presented Research at Harvard (e.g. HURS)	.23	.06	.21	.25	.49
Been Encouraged to Pursue Research	.61	.53	.70	.57	.68
<i>Problems with Research</i>					
Difficulty Communicating with Professor	.36	.28	.28	.48	.41
Unstimulating Lab Work	.15	.08	.12	.24	.19
Problems Finding Funding	.20	.18	.19	.27	.16
<i>Sources of, or information about, research opportunities and funding</i>					
HCRP/Student Employment Office	.56	.50	.53	.63	.57
E-mail Listservs	.45	.41	.38	.53	.49
CARAT	.28	.23	.28	.36	.21
Concentration Advisers	.54	.39	.56	.69	.54

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Res. Proctors/Tutors/Advisers	.35	.46	.36	.31	.21
Peer Advising Fellows	.10	.31	.03	.01	.01
Harvard College Undergraduate Research Association	.18	.31	.22	.10	.06
Other	.14	.07	.13	.16	.24
<i>Research outside of Harvard</i>					
Engaged in science research at other Harvard schools (e.g. med)	.22	.13	.21	.29	.31
Sought scientific research opportunities outside of Harvard	.50	.39	.48	.57	.60
Believes Harvard is helpful in arranging outside research opportunities	.50	.51	.54	.48	.47
Considered combining research with an international experience	.65	.72	.69	.61	.51
Academic Experiences					
Believes Harvard devotes enough resources to concentration	.76	.84	.79	.64	.79
Believes science courses more competitive than non-science	.74	.72	.78	.77	.65
Collaborates with peers in science courses	.86	.89	.83	.88	.85
Collaborates with peers in non-science courses	.51	.58	.48	.46	.53
<i>Believes that the following skills are important to future</i>					
Scientific Writing	.87	.91	.91	.82	.85
Oral Communication	.97	.99	.96	.96	.97
Knowledge of Current Scientific Literature	.84	.84	.83	.80	.90
Knowledge of Public Policy	.74	.79	.71	.72	.74
Ethics of Science	.68	.70	.71	.75	.56
Knowledge of other Scientific Fields	.81	.83	.87	.80	.71
<i>Believes that Harvard prepares one with the skills</i>					
Scientific Writing	.55	.50	.56	.56	.60
Oral Communication	.51	.58	.47	.48	.54
Knowledge of Current Scientific Literature	.59	.54	.59	.61	.62
Knowledge of Public Policy	.31	.43	.27	.24	.26
Ethics of Science	.26	.36	.25	.20	.21
Knowledge of other Scientific Fields	.63	.71	.58	.60	.63
General Experiences					
Satisfied with Harvard from an	.80	.86	.72	.76	.84

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academic perspective					
Satisfied with Harvard from a personal perspective	.73	.79	.72	.66	.76
Satisfied with concentration from an academic perspective	.74	.74	.76	.75	.69
Satisfied with concentration from a personal perspective	.71	.72	.66	.74	.72
Knows at least one faculty member who he or she knows reasonably well and feels cares about him or her	.62	.36	.57	.76	.90

General Comparison of Freshmen and Upperclassmen

Overall, responses from the two groups appear surprisingly similar, almost raising the question to what extent Harvard is successful in changing the aspirations and attitudes of its students. Of course, it is possible that the same number of students changes their mind each way. The number of students participating in research increases after Freshman year, as does the perceived ease of finding a lab. Slightly less than a half of Freshmen are encouraged to pursue research. Sources of information on research are similar. It is interesting that close to 40% of Freshmen seek information from concentration advisors.

Only 39% of Freshmen know a professor in their concentration reasonably well, which is not surprising. Much more worrisome is the fact that only 74% of Upperclassmen know a professor “reasonably well”.

Freshmen

28.6 % of all responses to the survey came from Freshmen.

Demographics

N = 116; 73 female, 43 male.

Concentrations, Secondaries, and Career Interests

Of the respondents, 53% are pursuing a secondary field. 65% of the respondents came to the college planning to study science.

56% of respondents are considering going into a career in medicine or healthcare, 34% are considering a career in life sciences, 27% are considering a career in applied science or engineering, 19% are considering a career in the physical sciences, 22% are considering a career in business and 12% are interested in consulting. 12% are considering law and 13% think about government.

Research Experiences

Research opportunities

26% of respondents have done research while at Harvard. Of those who are engaged in research, 30% of respondents spend 1-5 hours per week on research, 53% spend 6-10 hours per week on research, 7% spend 11-15 hours per week on research, 10% spend 16-20 hours per week on research. 89% of respondents believe that research opportunities are important for science education.

50% of respondents think that it is easy to find research opportunities at Harvard. 60% believe that there are many research opportunities available. 44% believe that their education is better enhanced in the laboratory than the classroom. 42% believe that there is ample opportunity to present research. 46% were encouraged to pursue research at Harvard.

8% have pursued summer research (meaning acceptance to a program, usually PRISE). 50% of respondents look to HCRP/SEO for information about research opportunities and funding, 38% look to their concentration advisors, 41% look to e-mail listservs, and 77% look to proctors, tutors, and advisors, 31% consult with HCURA, while 23% use the CARAT database. 39% of respondents have pursued science opportunities outside Harvard, 51% have found Harvard helpful in obtaining those opportunities, and 72% have considering combining their research with an international experience.

6% of respondents presented research at Harvard and 6% of respondents have been published in an undergraduate science journal.

Problems with research

27% of students had trouble establishing and/or maintaining contact with a research professor and 8% of students had issues with working in a laboratory without a clear intellectual goal. 18% of students had problems finding funding.

Academic Experiences

Collaboration and competition

72% believe that science classes are more competitive than non-science ones. 89% of respondents agree that they collaborate with peers in their concentration, while 58% agree that they do with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	91%	50%	0%	16%
Oral Communication	99%	58%	0%	14%
Knowledge of current scientific literature	84%	54%	3%	13%
Knowledge of public policy	79%	43%	5%	16%
Ethics of science	69%	36%	7%	14%
Knowledge of other scientific fields	83%	71%	1%	4%

General Experiences

Satisfaction with concentration and Harvard as a whole

74% of respondents are academically satisfied with their concentration, while 72% are personally satisfied with it. 86% are academically satisfied with Harvard as a whole, while 79% are personally satisfied with it.

Concentration resources

39% of respondents have at least one faculty member in the concentration who they know reasonably well and cares about them and 84% feel that Harvard directs enough resources to their concentration.

Upperclassmen

71.4% of all responses to the survey came from Upperclassmen.

Demographics

N = 289; 155 female, 134 male; 107 class of 2011, 114 class of 2010, 68 class of 2009.

Concentrations, Secondaries, and Career Interests

Of the respondents, 47% are pursuing a secondary field. 76% of the respondents came to the college planning to study science.

54% of respondents are considering going into a career in medicine or healthcare, 31% are considering a career in life sciences, 28% are considering a career in applied science or engineering, 21% are considering a career in the physical sciences, 20% are considering a career in business and 17% are interested in consulting. 12% are considering law and 11% think about government.

Research Experiences

Research opportunities

59% of respondents have done research while at Harvard. 16% of respondents spend 1-5 hours per week on research, 41% spend 6-10 hours per week on research, 22% spend 11-15 hours per week on research, 6% spend 16-20 hours per week on research, and 4% spend 21-25 hours per week. 79% of respondents believe that research opportunities are important for science education.

64% of respondents think that it is easy to find research opportunities at Harvard. 64% believe that there are many research opportunities available. 50% believe that their education is better enhanced in the laboratory than the classroom. 50% believe that there is ample opportunity to present research. 65% were encouraged to pursue research at Harvard.

50% have pursued summer research. 58% of respondents look to HCRP/SEO for information about research opportunities and funding, 61% look to their concentration advisors, 46% look to e-mail listservs, and 32% look to proctors, tutors, and advisors. 54% of respondents have pursued science opportunities outside Harvard, 50% have found Harvard helpful in obtaining those opportunities, and 62% have considering combining their research with an international experience.

30% of respondents presented research at Harvard and 10% of respondents have been published in an undergraduate science journal.

Problems with research

42% of students had trouble establishing and/or maintaining contact with a research professor and 22% of students had issues with working in a laboratory without a clear intellectual goal. 24% of students had problems finding funding.

Academic Experiences

Collaboration and competition

69% believe that science classes are more competitive than non-science ones. 53% of respondents agree that they collaborate with peers in their concentration, while 62% agree that they do with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	86%	58%	6%	20%
Oral Communication	96%	49%	0%	29%
Knowledge of current scientific literature	83%	61%	5%	17%
Knowledge of public policy	72%	41%	8%	25%
Ethics of science	68%	42%	9%	22%
Knowledge of other scientific fields	81%	60%	6%	12%

General Experiences

Satisfaction with concentration and Harvard as a whole

74% of respondents are academically satisfied with their concentration, while 71% are personally satisfied with it. 78% are academically satisfied with Harvard as a whole, while 71% are personally satisfied with it.

Concentration resources

74% of respondents have at least one faculty member in the concentration who they know reasonably well and cares about them and 73% feel that Harvard directs enough resources to the concentration.

Table 3: Comparison between Concentrations

All decimals represent the fraction of students in a particular concentration that answered in the affirmative for that category or question. For example: the .63 under Applied Math for the category of “Consulting or Finance” of Potential Career Choices means that 63% of these Applied Math concentrators are considering a career in that field.

	Overall	Applied Math	Astronomy	Biochemical Sci.	Biology	CPB	Chemistry	Chem. and Phys.	Computer Sci.	EPS	Eng. Sci. (AB)	Eng. Sci. (SB)	HEB	Joint Conc.	Mathematics	MCB	Neurobiology	OEB	Physics
Demographics																			
Sample size	406	19	8	8	6	21	40	5	11	9	14	17	14	9	18	57	43	20	32
Female	.56	.47	.25	.38	.67	.52	.43	.40	.45	.67	.64	.59	.71	.11	.17	.61	.74	.65	.41
Male	.44	.53	.75	.63	.33	.48	.58	.60	.55	.33	.29	.41	.29	.89	.83	.39	.26	.35	.59
Class of 2009 (seniors)	.17	.21	.00	.88	.67	.14	.15	.00	.18	.56	.14	.12	.21	.11	.33	.07	.09	.15	.13
Class of 2010 (juniors)	.28	.26	.38	.13	.00	.24	.38	.00	.36	.33	.29	.18	.43	.11	.33	.23	.30	.00	.25
Class of 2011 (sophomores)	.26	.47	.00	.00	.00	.33	.25	.80	.27	.11	.21	.29	.14	.33	.17	.40	.26	.25	.28
Class of 2012 (freshmen)	.29	.05	.63	.00	.33	.29	.23	.20	.18	.00	.29	.41	.21	.22	.17	.30	.35	.60	.32
Pursuing a Secondary Field	.47	.58	.25	.75	.33	.33	.38	.20	.45	.44	.57	.24	.64	.33	.61	.56	.42	.55	.47
Potential Career Choices (fractions add up to more than one because students could pick all potential career choices)																			
Applied Science or Engineering	.28	.53	.63	.00	.17	.10	.25	.40	.82	.33	.86	.94	.07	.33	.22	.11	.14	.05	.63
Business	.21	.42	.25	.13	.00	.10	.20	.00	.36	.22	.36	.35	.14	.00	.11	.09	.16	.20	.31
Consulting or Finance	.17	.63	.00	.00	.00	.05	.13	.20	.18	.33	.36	.29	.07	.33	.33	.05	.09	.10	.25
Government	.11	.05	.00	.00	.00	.05	.08	.00	.09	.22	.00	.18	.07	.22	.11	.05	.09	.10	.13
Law	.12	.11	.13	.13	.00	.05	.10	.00	.09	.11	.07	.24	.00	.33	.11	.05	.14	.10	.09
Life Sciences	.34	.16	.13	.25	.50	.71	.40	.80	.09	.00	.43	.18	.36	.00	.06	.60	.53	.75	.16
Medicine or Healthcare	.55	.11	.13	.63	1.0	.67	.63	.80	.09	.11	.57	.65	.86	.11	.06	.95	.77	.55	.06
Physical Sciences	.23	.16	1.0	.00	.00	.14	.38	1.0	.00	.78	.29	.24	.00	.89	.17	.04	.02	.05	.88
Other	.18	.16	.38	.25	.00	.00	.15	.00	.55	.00	.29	.00	.07	.22	.44	.05	.28	.20	.13
Concentration Choices																			
Initially thought science, decided on science	.76	.74	.75	1.0	.67	.95	.93	1.0	.82	.67	1.0	1.0	.79	.89	.94	.88	.79	.75	.88
Initially thought science, decided on non-science	.07	.00	.00	.00	.00	.00	.00	.00	.00	.11	.00	.00	.00	.00	.00	.00	.00	.00	.00
Initially thought non-science, decided on science	.08	.26	.13	.00	.17	.00	.05	.00	.09	.22	.00	.00	.21	.11	.06	.07	.14	.10	.06
Initially thought non-science, decided on non-science	.04	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Concentration not decided yet	.04	.00	.13	.00	.17	.05	.03	.00	.09	.00	.00	.00	.00	.00	.00	.05	.07	.15	.06
Research Experiences																			
Conducted/Conducting Labwork outside of Class	.49	.21	.50	1.0	.83	.76	.53	.40	.55	.67	.29	.35	.43	.33	.28	.65	.60	.60	.50
Spends 1-5 hrs/week in lab	.20	.25	.00	.00	.20	.06	.10	.50	.33	.00	.25	.50	.17	.00	.40	.11	.08	.58	.44
Spends 6-10 hrs/week in lab	.47	.50	.75	.50	.40	.44	.48	.50	.33	.83	1.0	.33	.67	.67	.40	.24	.54	.42	.38

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Spends 11-15 hrs/week in lab	.22	.25	.25	.38	.40	.31	.29	.00	.17	.17	.00	.17	.17	.33	.00	.32	.23	.00	.19
Spends 16-20 hrs/week in lab	.07	.25	.00	.13	.00	.06	.10	.00	.00	.00	.00	.00	.00	.00	.00	.19	.04	.00	.00
Spends 21-25 hrs/week in lab	.04	.00	.00	.00	.00	.13	.14	.00	.00	.00	.00	.17	.00	.00	.00	.05	.00	.00	.00
Believes research opportunities are important	.81	.74	.88	.88	.83	1.0	.88	1.0	.73	.78	.79	.82	.50	.78	.78	.93	.91	.85	1.0
Believes research opportunities are easy to find	.60	.42	.63	.63	.50	.86	.60	.20	.27	.89	.43	.53	.57	.56	.44	.63	.67	.70	.78
Believes there are many research opportunities	.62	.32	.75	.63	.83	.76	.63	.20	.45	.89	.43	.47	.71	.78	.33	.72	.79	.75	.72
Believes understanding of science is better enhanced in lab than in classroom	.47	.32	.63	.75	.67	.48	.55	.40	.36	.56	.71	.59	.36	.33	.33	.60	.47	.50	.44
Believes there are ample opportunities to present research	.47	.42	.38	.50	.50	.62	.40	.20	.27	.67	.29	.35	.57	.44	.39	.61	.58	.60	.50
Presented Research at Harvard (e.g. HURS)	.23	.16	.38	.25	.33	.48	.20	.00	.27	.33	.07	.35	.14	.11	.39	.28	.26	.20	.22
Been Encouraged to Pursue Research	.61	.47	.88	.88	.50	.71	.75	.60	.36	.56	.57	.71	.43	.56	.39	.74	.63	.65	.66
<i>Problems with Research</i>																			
Difficulty Communicating with Professor	.36	.32	.38	.38	.67	.38	.35	.40	.36	.33	.50	.35	.29	.11	.33	.33	.47	.15	.38
Unstimulating Lab Work	.15	.16	.25	.25	.50	.14	.25	.60	.00	.11	.07	.06	.14	.00	.11	.02	.12	.20	.25
Problems Finding Funding	.20	.05	.13	.50	.33	.24	.25	.40	.09	.11	.29	.29	.21	.11	.06	.19	.23	.25	.16
<i>Research outside of Harvard</i>																			
Engaged in science research at other Harvard schools (e.g. med)	.22	.26	.13	.63	.50	.43	.20	.20	.00	.22	.14	.24	.21	.00	.22	.40	.30	.05	.06
Sought scientific research opportunities outside of Harvard	.50	.42	.50	.63	.33	.57	.43	.60	.36	.67	.64	.59	.50	.44	.61	.61	.51	.60	.69
Believes Harvard is helpful in arranging outside research opportunities	.50	.37	.63	.50	.33	.57	.55	.60	.64	.67	.36	.41	.43	.56	.39	.58	.58	.50	.59
Considered combining research with an international experience	.65	.53	.88	.88	.50	.86	.60	.60	.55	.67	.64	.88	.43	.44	.39	.79	.81	.70	.72
Academic Experiences																			
Believes Harvard devotes enough resources to concentration (note: survey predated endowment hit)	.76	.58	1.0	1.0	1.0	.81	.83	.40	.82	1.0	.57	.59	.71	.89	.89	.89	.79	.65	.72
Believes science courses more competitive than non-science	.74	.84	.63	1.0	.83	.67	.80	.60	.64	.44	.93	.82	.93	.33	.39	.79	.84	.80	.53
Collaborates with peers in science courses	.86	.84	.75	.75	1.0	.95	.93	.80	.91	1.0	.93	1.0	.93	.78	.83	.86	.93	.85	.91
Collaborates with peers in	.51	.53	.38	.50	.67	.52	.55	.20	.27	.56	.50	.29	.50	.22	.17	.58	.63	.65	.31

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

non-science courses																			
<i>Believes that the following skills are important to future</i>																			
Scientific Writing	.87	.84	1.0	.88	1.0	1.0	.90	1.0	.82	.89	.93	.94	.71	.78	.83	.96	.91	1.0	.91
Oral Communication	.97	.95	.88	1.0	1.0	1.0	.93	1.0	1.0	1.0	1.0	.94	1.0	1.0	.94	1.0	.95	1.0	1.0
Knowledge of Current Scientific Literature	.84	.63	.63	1.0	1.0	1.0	.90	1.0	.82	1.0	.86	.88	.93	.67	.94	.91	.93	.80	.78
Knowledge of Public Policy	.74	.68	.13	.63	.83	.81	.73	1.0	.36	.89	.71	.71	1.0	.78	.39	.84	.81	.75	.69
Ethics of Science	.68	.42	.50	.63	1.0	.81	.80	.60	.45	.44	.57	.88	1.0	.89	.39	.89	.91	.70	.53
Knowledge of other Scientific Fields	.81	.68	.63	.75	.83	.90	.90	1.0	.64	.78	.86	1.0	.79	1.0	.83	.79	.81	.85	.84
<i>Believes that Harvard prepares one with the skills</i>																			
Scientific Writing	.55	.42	.88	.75	.67	.62	.58	.20	.55	.56	.43	.24	.86	.33	.50	.68	.70	.55	.25
Oral Communication	.51	.47	.50	.38	.33	.48	.58	.20	.36	.56	.50	.71	.64	.44	.56	.47	.56	.70	.41
Knowledge of Current Scientific Literature	.59	.21	.75	.88	.67	.81	.63	.60	.64	.56	.50	.24	.93	.44	.61	.77	.77	.85	.16
Knowledge of Public Policy	.31	.16	.13	.13	.33	.24	.30	.20	.36	.44	.36	.24	.57	.33	.17	.37	.37	.45	.09
Ethics of Science	.26	.16	.13	.00	.17	.19	.33	.20	.36	.11	.21	.18	.36	.33	.06	.39	.35	.35	.06
Knowledge of other Scientific Fields	.63	.42	.38	.50	.83	.86	.75	.80	.45	.67	.57	.71	.79	.44	.89	.60	.72	.70	.38
General Experiences																			
Satisfied with Harvard from an academic perspective	.80	.89	.75	.88	.83	.95	.78	.60	.91	.78	.79	.76	.93	.89	.89	.86	.84	.65	.75
Satisfied with Harvard from a personal perspective	.73	.58	.38	.75	.83	.95	.75	.60	.82	.67	.71	.71	.86	1.0	.61	.75	.70	.75	.84
Satisfied with concentration from an academic perspective	.74	.63	.88	.75	.50	.81	.80	.60	.91	.89	.64	.65	.79	.78	.83	.79	.70	.75	.75
Satisfied with concentration from a personal perspective	.71	.63	.63	.50	.50	.71	.73	.40	.73	1.0	.71	.59	.86	.78	.94	.63	.74	.75	.78
Knows at least one faculty member who he or she knows reasonably well and feels cares about him or her	.62	.47	.88	.88	.67	.81	.70	.60	.64	1.0	.50	.53	.71	.78	.67	.51	.49	.65	.81

Applied Mathematics

General Comparisons

Assuming a representative sample, a higher proportion of Applied Math students pursue secondary fields (58% versus 47% in the general science student body). Though a similar percentage of Applied Math concentrators believe research is important for their science education, unfortunately fewer Applied Math students (42%) agree that it is easy to find search opportunities, compared to the general science student body (60%). Similarly only 32% feel that there are many research opportunities compared to 62% of the general science student body. Regarding academics, there was a high degree of similarity between the percentage of Applied Math concentrators who believed certain skills to be important and the percentage of the overall science student body – with the exception of Ethics of Science, which only 42% of concentrators believed to be important compared to 74% of the general population (32% of concentrators believed science ethics to be unimportant versus 8% of the general science student body). Interestingly, a higher percentage of Applied Math concentrators report being academically satisfied with their concentration (89% versus 74%), but fewer report being personally satisfied (58% v 71%). Less than half (47%) of the Applied Math respondents report knowing at least one faculty member in the concentration reasonably well, compared to 62% in the overall science student population. Finally, only 58% feel that Harvard directs enough resources to the concentration compared to 76% overall.

Demographics

N = 19; 9 female, 10 male; 1 class of 2012, 9 class of 2011, 5 class of 2010, 4 class of 2009

Concentrations, Secondaries, and Career Interests

Over a quarter of the students (26%) report switching to applied mathematics from economics due to the lack of mathematical rigor in the latter and the flexibility of the former. Of the respondents, 58% (11) are pursuing a secondary field, listed as Economics, Statistics, MCB, MBB and music. When asked to select one or more potential career options, the most popular responses were consulting and finance (63%), applied science or engineering (53%) and business (42%).

Research Experiences

Research opportunities

Five students (26%) report having done lab research before college, while only four (21%) report continuing lab research in college – perhaps due to the nature of applied math research. Half of

these students spend 6-10 hours per week on the research. 74% of respondents believe that research opportunities are important for science education.¹⁷

Only 42% of respondents think that it is easy to find research opportunities at Harvard and 32% believe that there are many research opportunities available, while 16% and 32%, respectively, disagree with those statements. 32% believe that their education is better enhanced in the laboratory than the classroom, while 16% disagree. 42% believe that there is ample opportunity to present research. 47% were encouraged to pursue research, primarily by professors (like David Morin and Matt Welsh) and teaching fellows, but also by friends and freshman/sophomore advisers.

37% have pursued summer research, through HCRP, PRISE, the Harvard Initiative for Global Health, and Herschel Smith. 42% of respondents look to their concentration adviser for information about research opportunities and funding. Between a quarter to half of respondents have pursued science opportunities outside Harvard (42%), have found Harvard helpful in obtaining those opportunities (37%), and have considering combining their research with an international experience (53%). Only 26% have engaged in research at other Harvard schools.

16% of respondents presented research at Harvard, through the PRISE program. One attended student science activities, and two published in an undergraduate science journal.

Problems with research

32% of students had trouble establishing and/or maintaining contact with a research professor. 16% reported performing unstimulating lab work, and one student (5%) had problems finding funding.

Academic Experiences

Collaboration and competition

84% believe that science classes are more competitive than non-science ones, while 5% disagree. Again, 84% of respondents agree that they collaborate with peers in their concentration, while only 53% agree that they do with non-concentration peers. 37% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

¹⁷ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	84%	42%	5%	21%
Oral Communication	95%	47%	0%	11%
Knowledge of current scientific literature	63%	21%	16%	26%
Knowledge of public policy	68%	16%	5%	37%
Ethics of science	42%	16%	32%	37%
Knowledge of other scientific fields	68%	42%	11%	5%

General Experiences

Satisfaction with concentration and Harvard as a whole

89% of respondents are academically satisfied with Applied Mathematics as their concentration, while only 58% are personally satisfied with it. In contrast, 63% are academically satisfied with Harvard as a whole, while 5% are not. 63% are personally satisfied with Harvard, and 11% are not.

Concentration resources

Less than half (47%) of the respondents report knowing at least one faculty member in the concentration reasonably well and who they feel cares about them. These professors were met mostly through research, but some were also met through class, such as one freshman seminar. Only 58% feel that Harvard directs enough resources to the concentration, with two students asking for more social and community-based events within the concentration.

Qualitative observations

Applied math concentrators found that the science culture was rigorous and demanding. Some characterizations include:

- ‘Heavily research based, feel like you should do a thesis. Generally collaborative, but difficult. Need to form good bonds with lab, or strong connection over longer time.’
- ‘Rich and diverse. Competitive as well.’
- ‘Vibrant, dynamic, open and welcoming, encouraging, rigorous.’

When asked for suggestions for specific improvements to the Applied Mathematics concentration, students said the following:

- ‘More courses and the ability to count courses from different departments as credit (i.e. statistics classes should count for applied math credit!!!!)’
- ‘The concentration is decentralized--in Applied Math that might be unavoidable--but it could use some more cohesion between students and between students and faculty.’
- ‘There are never applied math social events, so I barely know who else is in the department (professors, students, etc.). Should take a cue from the Stats department, which has wonderful social events (open bar at Grendels!) and a great community’
- ‘I’m not sure how to look for jobs during the year that would give me hands on experience.’

Astronomy and Astrophysics

General Comparisons

While some responses of the Astronomy and Astrophysics concentrators follow the general trends revealed by the study, many differences stand out. Fewer students in Astronomy and Astrophysics pursue a secondary field (25% vs. 47% of the overall respondents). Their career interests are strictly limited to the physical and applied sciences, while those of students in other disciplines often include unrelated fields. Slightly more Astronomy students came to the college with previous research experience (50% vs. 38% of the general population), believe in the importance of research to their education (88% vs. 81%) and think that research opportunities at Harvard are plentiful (75% vs. 62%). They also reported being more frequently encouraged to pursue research (88% vs. 61%) and they look for the advice towards their concentration advisor more than their peers do (63% vs. 54%). Although students in Astronomy pursue summer research opportunities less frequently than concentrators in other disciplines (25% vs. 36%), many are interested in combining research with an international experience (88% vs. 65% of all the students who responded). Significantly more students in Astronomy know a professor well (88% vs. 62%).

While 74% of the general population feel that science classes are more competitive than other, only 63% of Astronomy and Astrophysics students agree. They are also much less interested in many of the general skills we inquired about. This includes knowledge of current scientific literature (63% for A&A vs. 84% for general population), public policy (13% vs. 81%) and ethics of science (50% vs. 74%). 38% of Astronomy students do not consider public policy and ethics at all important, which is a strikingly high number, even considering the small sample size. Finally, while Astronomy and Astrophysics concentrators are more academically satisfied with their department (88% vs. 74%), they report lower personal satisfaction with it (63% vs. 71%). Only 38% are personally satisfied with Harvard (vs. 73% of all respondents).

Demographics

N = 8; 2 female, 6 male; 5 class of 2012, 0 class of 2011, 3 class of 2010, 60 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 25% are pursuing a secondary field, in English or Chemistry. All respondents are considering a career in the physical sciences, and 63% are also considering one in Applied Science or Engineering.

Research Experiences

Research opportunities

Half of the respondents came to the College having previously done research. Half have done research while attending the College, all through the Center for Astrophysics. Three of the four

respondents who do research spend 6-10 hours per week on it. 88% of respondents believe that research opportunities are important for science education, while 13% disagree.¹⁸

63% of respondents think that it is easy to find research opportunities at Harvard and that their education is better enhanced in the laboratory than the classroom, while 13% disagree with both statements. 75% think and that there are many research opportunities at Harvard, while 13% disagree. 88% were encouraged to pursue research, primarily by professors. Three students mentioned Professor David Charbonneau and one mentioned Professor Stubbs as encouraging them to do research.

25% have pursued summer research, one through REUs and one through off-campus research. The largest majority, 63% of respondents, looks to their concentration adviser for information about research opportunities and funding, while half look to HCRP/SEO. 50% of respondents have pursued science opportunities outside Harvard, 63% have found Harvard helpful in obtaining those opportunities, and 88% have considering combining their research with an international experience. Only 13% have engaged in research at other Harvard schools.

38% of respondents presented research at Harvard, through tutorial, AAS or small class presentations. One student presented research through BURS, and one published in the Harvard Science Review.

Problems with research

38% of students had trouble establishing and/or maintaining contact with a research professor. 25% had issues with working in a laboratory without a clear intellectual goal and problems finding funding, and one student had trouble finding funding.

Academic Experiences

Collaboration and competition

63% believe that science classes are more competitive than non-science ones. 75% of respondents agree that they collaborate with peers in their concentration, while only 38% agree that they do with non-concentration peers. 13% do not collaborate with concentration peers and 38% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

¹⁸ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	100%	88%	0%	0%
Oral Communication	88%	50%	13%	25%
Knowledge of current scientific literature	63%	75%	0%	0%
Knowledge of public policy	13%	13%	38%	38%
Ethics of science	50%	13%	38%	50%
Knowledge of other scientific fields	63%	38%	13%	13%

General Experiences

Satisfaction with concentration and Harvard as a whole

88% of respondents are academically satisfied with Astronomy and Astrophysics as their concentration, while 63% are personally satisfied with it and 13% are not personally satisfied with it. In contrast, 75% are academically satisfied with Harvard as a whole, while 13% are not. 38% are personally satisfied with Harvard, and 13% are not.

Concentration resources

88% of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. All also feel that Harvard directs enough resources to the concentration.

Qualitative observations

Most respondents felt that students who are ‘pre-’ (i.e. pre-med, pre-law, pre-academic) dominate Harvard. One felt that Harvard was geared toward students who went to private and premier high schools, such that students without that background are ill prepared for the course work. Others felt that ‘extremely competitive, high strung’ students are omnipresent.

Opinions about the culture of science at Harvard were extremely varied, and included:

- ‘Cutting edge research, yet still available and encouraged to undergrads’
- ‘Insular’
- ‘Pre-med oriented in general. Physics courses cater too much to the top of the class.’
- ‘Very competitive and unwelcoming.’

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

- ‘Science is important here. It is taken seriously and people work hard on it.’
- ‘Too focused on problem set skills rather than research skills.’
- ‘Supportive, exciting, intense’
- ‘Competitive’ but ‘fun’

Suggested specific improvements for the department:

- ‘...more concentrators and a better club community’ (a la SPS)
- ‘Less focus on problem sets and equations that are only theory than on practical understanding and skills.’

Biochemical Sciences

General Comparison

Biochemical Sciences concentrators were significantly more interested in secondary fields than the general population (75% vs. 47%). They were also more interested and likely to engage in research (100% vs. 49%). Furthermore, a larger percentage of B. S. students believed that research is more important for their educational experience than classroom learning (75% vs. 47%) and were more likely to participate in research over the summer (63% vs. 36%). They also reported fewer problems with finding a lab or research funding.

Demographics

N = 8; 3 female, 5 male; 0 class of 2012, 0 class of 2011, 1 class of 2010, 7 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 75% are pursuing a secondary field, listed as MBB, Health Policy, Romance Languages, and Economics. 68% of respondents are considering going into a career in medicine; with further 25% are interested in a career in the life sciences. One respondent plans to become a Catholic priest and one wants to be a journalist.

Research Experiences

Research opportunities

All of the students came to Harvard without previous research experience and planning to concentrate in science. All have engaged in scientific research at Harvard. Although 1 person called research an unimportant part of their education, all the others considered it important. 50% spend 6-10 hours per week doing research, while the other 50% work in research for 10-20 hours each week. Most of the research is conducted in Longwood.

63% of respondents think that it is easy to find research opportunities at Harvard and that there are many research opportunities available, while 13% (one person) disagree with both statements. 75% believe that their education is better enhanced in the laboratory than the classroom. Only 50% percent think that there are enough options to present research results and 25% openly disagree with this statement. Students report being encouraged to pursue research by concentration and sciences advisors (Tom Torello, Greg Tucci, Ann Georgi), as well as professors.

63% have pursued summer research, through HCRP, PRISE and off-campus programs, including The Ludwig Institute and University of Florida. 75% of respondents mentioned Student Employment Office, Harvard College Research Program and concentration advisers as sources

of information about research funding. Although 88% considered combining scientific research with an international experience and sought extramural research opportunities, only 50% have found Harvard helpful in obtaining those opportunities. Most (63%) have engaged in research at other Harvard schools. A few of the respondents complained about finding research positions in Cambridge, stating that many labs have enough undergraduates and the only place to find a position is the Medical School.

Only 25% of respondents presented research at Harvard, through the Boston Undergraduate Research Symposium (BURS), the Department senior thesis presentation, or PRISE. However, 38% participated in research activities organized by student groups. None published in an undergraduate science journal.

Problems with research

38% of students had trouble establishing and/or maintaining contact with a research professor. 25% had issues with working in a laboratory without a clear intellectual goal and 50% had problems finding funding. Although these findings are limited to a sample of eight individuals, the problem with funding appears to be greater within Biochemical Sciences, compared to other science concentrations.

Academic Experiences

Collaboration and competition

All respondents believe that science classes are more competitive than non-science ones. 75% respondents collaborate with peers in their concentration, while only 50% do with non-concentration peers. 38% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	88%	75%	13%	0%
Oral Communication	100%	38%	0%	63%
Knowledge of current scientific literature	100%	88%	0%	0%
Knowledge of public policy	63%	15%	0%	50%

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

Ethics of science	63%	0%	25%	75%
Knowledge of other scientific fields	75%	25%	0%	50%

General Experiences

Satisfaction with concentration and Harvard as a whole

75% of respondents are academically satisfied with Biochemical Sciences as their concentration, but only 50% are personally satisfied with it. Respectively, 25% and 38% are unsatisfied with the concentration on the academic and personal level. In contrast, 88% are academically satisfied with Harvard as a whole, while 13% are not. 75% are personally satisfied with Harvard, and 25% are not.

Concentration resources

88% the respondents have at least one faculty member in the concentration that they know reasonably well and who they feel cares about them. Also, all feel that Harvard directs enough resources to the concentration.

Qualitative observations

Biochemical Sciences concentrators generally found that the science culture was negative and geared strictly towards those wishing to become doctors or academic researchers. Some examples are reproduced below:

- “The culture is too competitive. We should be more collaborative with one another, but most people don't care about anything but their own grades, even to the point of sacrificing their health.”
- “I've managed to stay on the periphery of the "culture of science at Harvard," and I like it that way.”
- “The life sciences are cutthroat. Loaded with grade-hungry premeds, the culture prides stress and intensity. The courses (organic chemistry and mcb 52 and 54) are work heavy and tiring, often unnecessarily.”
- “Competitive. Cutthroat. Unpleasant. Stressful. Over-demanding.”
- “competitive yet collaborative”

We are omitting the comments on improvements to the concentration since it longer exists.

Biology

General Comparisons

Biology concentrators were more likely than the general population to engage in research (100% vs. 49%) and to pursue research over the summer (100% vs. 36%). However, they also experienced significantly more problems with research. Biology students appeared more satisfied with the level of teaching about scientific literature and scientific writing (75% for both). These comparisons may be unreliable due to the small sample size (n=4).

Demographics

N = 4; 3 female, 1 male; 4 class of 2009 (Excluded responses from 2 undecided Freshmen.)

Concentrations, Secondaries, and Career Interests

Of the 4 respondents, one pursued a secondary field in Health Policy. Three respondents came to the college planning to study science, while one decided to concentrate in Biology to facilitate fulfilling the pre-med requirements. All the respondents are considering medicine and one of them is interested in a Life Sciences career.

Research Experiences

Research opportunities

One of the respondents came to the College having previously done research. All four conducted research for no course credit in the Departments of OEB and Biological Anthropology, as well as at the MGH and the Medical School. All the respondents spent 5-15 hours per week on this activity.

3 of the respondents believe that research is important to their scientific education and that opportunities for it are plentiful at Harvard. Only two agreed that there are sufficient opportunities to present research at the College. Each of the statements was negated by one person. Two people presented their research at Harvard. Three were actually encouraged to pursue research (by Dr. Andrew Berry, Dr. Ann Georgi and various other advisors).

The main sources of information about research and funding have been email lists, CARAT database and the HCRP/SEO.

Three of the students pursued research opportunities over the summer (with PRISE and the Bauer Centre). Two spent a summer at another university.

Problems with research

Two of the respondents experienced problems with funding, three with unexciting work, and all had problems communicating with mentors.

Academic Experiences

Collaboration and competition

All of the students believe that science classes are more competitive than non-science ones, and all report collaboration with peers in concentration classes.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	100%	75%	0%	25%
Oral Communication	100%	50%	0%	50%
Knowledge of current scientific literature	100%	75%	0%	0%
Knowledge of public policy	75%	25%	25%	25%
Ethics of science	100%	25%	0%	50%
Knowledge of other scientific fields	100%	100%	0%	0%

General Experiences

Satisfaction with concentration and Harvard as a whole

75% of the respondents were both academically and personally satisfied with OEB as a concentration. Harvard is rated as overall personally and academically satisfying by all of the respondents.

Concentration resources

All of the respondents know a faculty member in their Department (i.e. one of the Biology Departments) reasonably well and feel that Harvard directs enough resources to the concentration.

Qualitative observations

The qualitative comments below reflect on scientific experiences in general and on the Biology concentration:

- “Results-driven and impersonal. [Needs] Better advising in choosing a lab”
- “Coursework is way harder than for non-sciences, and most science students I know are annoyed because this is rarely acknowledged.”
- “Be good or get out. [The dominant type of student is] a pre-med, self-motivated and persistent. Don't eliminate [the Biology concentration]! I think it's a mistake to force students to specialize earlier and earlier. [...] There are things as a science student at Harvard that I am incredibly grateful for (like the PS courses and MCB 80). That being said, I think there's still a lot more that can and should be done.”

Chemical and Physical Biology

General Comparisons

Demographics:

Of the 406 total respondents, 21 are concentrators in Chemical and Physical Biology (CPB). While a 55% majority of overall respondents are considering a career in medicine or healthcare, 71% of CPB respondents are considering a career in Life Science. In contrast, only 34% of the overall respondents are considering a career path in Life Science.

Research Opportunities:

While 49% of the overall respondents have done research at Harvard, 71% of CPB respondents took part in research. 47% of overall body of respondents who took part in research indicated that they spent 6-10 hours per week doing research. 44% of CPB students taking part in research similarly indicated that they spent 6-10 hours per week doing research. Likewise, 81% of overall respondents and 78% of CPB respondents believe that research opportunities are important for science education. Though 100% of CPB respondents think that it is easy to find research opportunities at Harvard, only 60% of respondents agree. 62% of CPB respondents and 47% of overall respondents believe that there are ample opportunities to present research at Harvard. In addition, 67% of CPB respondents have pursued summer research, while only 36% of overall respondents have pursued summer research. 81% of CPB respondents and 56% of overall respondents (a majority in both groups), look to HCRP/SEO for information about research opportunities and funding, followed by concentration advisors (67% and 54%, respectively) and listservs (57% and 45%, respectively). Though 48% of CPB respondents presented research at Harvard, only 23% of overall respondents have done so. Moreover, 29% of CPB respondents have been published in an undergraduate science journal, as opposed to the 8% of overall respondents who have been accordingly published.

Academic Experiences:

67% of CPB respondents and 74% of overall respondents believe that science classes are more competitive than non-science classes. 95% of CPB respondents collaborate with their peers in their concentration, whereas 86% of overall respondents concentrate with their peers in their concentration. 100% of CPB respondents believe that knowledge of current scientific literature is important and 81% indicate that Harvard provides this information. In contrast, only 84% of overall respondents believe that knowledge of current scientific literature is important and 59% of respondents believe that Harvard provides this information. Similarly, 90% of CPB respondents believe that knowledge of other scientific fields are important and 86% of CPB respondents believe that Harvard provides this knowledge. On the other hand, 68% of overall respondents believe that knowledge of other scientific fields are important and only 63% of overall respondents believe that Harvard provides this information.

General Experiences:

While 81% of CPB respondents are satisfied with CPB as their concentration, 74% of the overall respondents are satisfied with their concentration. 71% of both subject groups are personally satisfied with their concentration. Moreover, 95% of CPB respondents are academically and

personally satisfied with Harvard as a whole, 80% of overall respondents are academically satisfied with Harvard and 73% of respondents are personally satisfied with Harvard as a whole.

Demographics

N = 21; 11 female, 10 male; 6 class of 2012, 7 class of 2011, 5 class of 2010, 3 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 33% are pursuing a secondary field, listed as Economics, Music, English, Computer Science, and Classics. 71% of respondents are considering going into a career in life sciences, 67% are considering a career in life sciences, and 14% are considering a career in physical sciences.

Research Experiences

Research opportunities

71% of respondents have done research while at Harvard. Of these respondents, 7 have done research in the MCB Department and 3 have done research in the FAS Center for Systems Biology. 44% of respondents spend 6-10 hours per week on research, 31% spend 11-15 hours per week on research, and 13% of respondents spend 21-25 hours per week on research. 78% of respondents believe that research opportunities are important for science education.

100% of respondents think that it is easy to find research opportunities at Harvard. 76% believe that there are many research opportunities available, while 5% disagree. 48% believe that their education is better enhanced in the laboratory than the classroom, while 10% disagree. 62% believe that there is ample opportunity to present research. 71% were encouraged to pursue research, primarily by professors, freshmen advisors, and sophomore advisors.

67% have pursued summer research, predominantly through PRISE. 81% of respondents look to HCRP/SEO for information about research opportunities and funding, while 67% look to their concentration advisors and 57% look to e-mail listservs. 57% of respondents have pursued science opportunities outside Harvard, 57% have found Harvard helpful in obtaining those opportunities, and 86% have considering combining their research with an international experience.

48% of respondents presented research at Harvard, predominantly through PRISE symposiums and the Harvard Undergraduate Research Symposiums. 29% of respondents have been published in an undergraduate science journal.

Problems with research

38% of students had trouble establishing and/or maintaining contact with a research professor and 14% of students had issues with working in a laboratory without a clear intellectual goal. 24% of students had problems finding funding.

Academic Experiences

Collaboration and competition

67% believe that science classes are more competitive than non-science ones, while 10% disagree. 95% of respondents agree that they collaborate with peers in their concentration, while 52% agree that they do with non-concentration peers. 24% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	100%	62%	0%	29%
Oral Communication	100%	48%	0%	29%
Knowledge of current scientific literature	100%	81%	0%	19%
Knowledge of public policy	81%	24%	14%	33%
Ethics of science	81%	19%	14%	38%
Knowledge of other scientific fields	90%	86%	5%	5%

General Experiences

Satisfaction with concentration and Harvard as a whole

81% of respondents are academically satisfied with Chemical and Physical Biology as their concentration, while 71% are personally satisfied with it. 95% are academically and personally satisfied with Harvard as a whole.

Concentration resources

81% of respondents have at least one faculty member in the concentration who they know reasonably well and cares about them and feel that Harvard directs enough resources to the concentration.

Qualitative observations

There was a general feeling that ‘pre-professional’ students dominate Harvard as a whole and concentrators generally characterize the science culture as both collaborative and competitive. Some characterizations include:

- ‘High-energy, state-of-the-art, interdisciplinary’
- ‘Half camaraderie in enjoyment of knowledge, half vicious battle broiling just below the surface of everyone’s interactions with classmates.’
- ‘...Science courses are very difficult, with a lot of material and a large workload.’
- ‘...There is a strong culture of science at Harvard, particularly with so many premed students.’
- ‘Science [at] Harvard is a cooperative community of people who are often interested in interdisciplinary subjects.’

Asked for suggestions for specific improvements, the responses included:

- ‘Providing more funding opportunities would be helpful...’
- ‘I am consistently disappointed with the way that the life sciences are taught here...I think that biology could be taught much more conceptually, more critically, and with less tedium.’
- ‘Labs and sections are particularly ineffective.’

Chemistry and Physics

General comparisons

Although the small number of responses (n=5, including a Freshman) makes it hard to draw valid comparisons, Chemistry and Physics stands out in a few negative ways. While 60% of all the respondents to the survey said that it is easy to find research opportunities, among Chemistry and Physics concentrators only 20% agreed, and 20% openly disagreed with this statement. Working in the lab without a clear intellectual goal is reported by only 15% of all the students across concentrations who engaged in research and by 60% of all the Chemistry and Physics students. While 86% of the respondents collaborate with peers in their concentrations, 80% of Chemistry and Physics students do not. Finally, the C&P concentrators report low levels of satisfaction with their field, academically (60% vs. 74% among the general population) and personally (40% vs. 71%). 40% are personally and academically unsatisfied with Harvard.

Demographics

N = 5; 2 female, 3 male; 1 class of 2012, 4 class of 2011, 0 class of 2010, 0 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, one is pursuing a secondary field in music. All respondents are considering going into a career in the physical sciences; four (80%) are also considering life sciences and medicine/health care, each.

Research Experiences

Research opportunities

40% of the respondents came to the College having previously done research, and 40% have done research while attending the College, through the Department or HMS/CCB. 100% of respondents believe that research opportunities are important for science education.¹⁹

20% of respondents think that it is easy to find research opportunities at Harvard and that there is ample opportunity to pursue research at Harvard. 20% disagree that research opportunities are easy to find. 40% believe that their education is better enhanced in the laboratory than the classroom. 60% were encouraged to pursue research, by professors, advisers, teaching fellows and peers.

40% have pursued summer research, through PRISE or an off-campus program. There is no consistent pattern regarding where students look for information about and funding for research.

¹⁹ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

60% of respondents have pursued science opportunities outside Harvard, have found Harvard helpful in obtaining those opportunities, and have considering combining their research with an international experience. Only 20% have engaged in research at other Harvard schools.

None of the respondents have presented research at Harvard, and none have published in an undergraduate science review. Two have attended undergraduate science activities, through BURS and HURS.

Problems with research

40% of students had trouble establishing and/or maintaining contact with a research professor. 60% had issues with working in a laboratory without a clear intellectual goal and problems finding funding, and 40% had trouble finding funding.

Academic Experiences

Collaboration and competition

60% believe that science classes are more competitive than non-science ones. 80% of respondents agree that they collaborate with peers in their concentration, while only 20% agree that they do with non-concentration peers. 80% do not collaborate with concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	100%	20%	0%	40%
Oral Communication	100%	20%	0%	40%
Knowledge of current scientific literature	100%	60%	0%	0%
Knowledge of public policy	100%	20%	0%	20%
Ethics of science	60%	20%	40%	40%
Knowledge of other scientific fields	100%	80%	0%	20%

General Experiences

Satisfaction with concentration and Harvard as a whole

60% of respondents are academically satisfied with Chemistry and Physics as their concentration, while 40% are personally satisfied with it and 20% are neither academically nor personally satisfied with it. 60% are academically and personally satisfied with Harvard as a whole, while 40% are neither academically nor personally satisfied with Harvard.

Concentration resources

60% of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. One mentioned David Morin specifically; the other two referred to their concentration advisers. 40% feel that Harvard directs enough resources to the concentration.

Qualitative observations

Most respondents felt that students who are pre-professional dominate Harvard. One felt that whoever was motivated would do well at Harvard, while another stated ‘[the pre-professional atmosphere] makes grades cut-throat. There is rampant cheating but no one really pays attention to it, and if you don't cheat, you don't do as well as the curve.’

Opinions about the culture of science at Harvard were extremely varied, and included:

- ‘Very insular and competitive’
- ‘Common, broad’
- ‘Teamwork’, ‘challenging’
- Sentiment that undergraduates are the lowest on the priority ladder

Suggested specific improvements for the department:

- ‘Change the intro classes; they make concentrators drop like flies. The professors are intimidating ... and the classes unnecessarily fast-paced.’
- ‘A more tight-knit community outside the classroom, across classes and labs. Class dynamics are great, but with others not so much. More concentration wide social events.’

Chemistry

General comparisons

There exist slight but mostly positive differences between the survey results for Chemistry and for the sciences in general. An exceptionally high proportion of Chemistry students inquire with their concentration advisor about research opportunities (83% vs. 54% of the general population). 70 % were encouraged to pursue research (as opposed to 61% overall). However, even though 55% of students in Chemistry (and only 47% in general) think that their education is better enhanced in a laboratory than in a classroom, as few as 40% think that there are ample research opportunities (47% for all respondents). 25% of those who participate in research complain about work without clear intellectual goal (vs. 15% of the general population). Chemistry students collaborate on their concentration classes more than students in other fields (93% vs. 86%). They also more frequently think that Harvard directs enough resources to their concentration (83% vs. 76%) and they are more likely to know a professor in their Department well (70% vs. 62%). Finally, Chemistry students stand out for their appreciation of the importance of knowing other scientific fields (90% vs. 68% of the general population think this knowledge is important).

Demographics

N = 40; 17 female, 23 male; 9 class of 2012, 10 class of 2011, 15 class of 2010, 6 class of 2009.

Concentrations, Secondaries, and Career Interests

Almost all of the students (93%) reported starting out college with the intention to concentrate in a scientific field. 38% (15 students) are pursuing a secondary field in a diverse cross-section of areas, including Government, Economics, Health Policy, VES, EPS, English, Study of Religion, and Dramatic Arts. When asked to select one or more potential career options, the three most popular responses were medicine or healthcare (63%), life sciences (40%) and physical sciences (43%).

Research Experiences

Research opportunities

Sixteen students (40%) report having done lab research before college and 21 (53%) report doing research in college. 48% of those who do research spend 6-10 hours per week on the research. 88% of respondents believe that research opportunities are important for science education.²⁰

²⁰ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

60% of respondents think that it is easy to find research opportunities and 63% think that there are many such opportunities available, whereas 15% disagree with both statements. 55% believe that their chemistry education is better enhanced in the laboratory than the classroom, while 3% disagree. 40% believe that there is ample opportunity to present research. 75% were encouraged to pursue research, primarily by professors (like Professors Tucci, Ritter and Herschbach), sophomore advisers, and peers.

35% have pursued summer research through PRISE and off-campus REUs as well as funding from HCRP, Herchel Smith, and HIGH. A high 83% of respondents look to their concentration adviser for information about research opportunities and funding. A minority of the respondents have pursued science opportunities outside Harvard (43%), have found Harvard helpful in obtaining those opportunities (55%), and have considering combining their research with an international experience (60%). Only eight students (20%) have engaged in research at other Harvard schools.

20% of respondents presented research at Harvard, through HURS and BURS. Seven attended student science activities, and two published in an undergraduate science journal.

Problems with research

35% of the students had trouble establishing and/or maintaining contact with a research professor. A quarter of students (10) reported performing unstimulating lab work; the same number of students (25%) had problems finding funding.

Academic Experiences

Collaboration and competition

80% believe that science classes are more competitive than non-science ones, while 5% disagree. 93% of respondents agree that they collaborate with peers in their concentration, while only 55% agree that they do with non-concentration peers. 23% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	90%	58%	5%	10%

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

Oral Communication	93%	58%	3%	25%
Knowledge of current scientific literature	90%	63%	5%	18%
Knowledge of public policy	73%	30%	8%	38%
Ethics of science	80%	33%	5%	38%
Knowledge of other scientific fields	90%	75%	0%	10%

General Experiences

Satisfaction with concentration and Harvard as a whole

78% of respondents are academically satisfied with Chemistry as their concentration, and 75% are personally satisfied with it. Similarly, 80% are academically satisfied with Harvard as a whole, while 8% are not. 73% are personally satisfied with Harvard, while 15% are not.

Concentration resources

28 (70%) of the respondents report knowing at least one faculty member in the concentration reasonably well and who they feel cares about them. These professors were met mostly through research; in addition, Gregg Tucci the concentration adviser seems to have a particularly good relationship with concentrators, one of whom said, "To some degree, I feel that the Chem advisor, Gregg Tucci, has that kind of relationship with all of us in the concentration." A high 83% feel that Harvard directs enough resources to the concentration; those who feel otherwise have sporadic objections and requests such as the need for smaller class sizes, better equipment in the laboratories, and more money for social events or trips.

Qualitative observations

Chemistry concentrators found that the overall culture of science at Harvard was interdisciplinary and collaborations. Some characterizations include:

- 'Science at Harvard is generally more difficult than other concentrations - it involves much more class time (i.e. physically being present for labs) and much more work (weekly assignments as opposed to a few papers a semester).'
- 'It is really not surprising that many people studying science here become disillusioned and switch to the humanities; I feel that the humanities are given more attention, funding, and is less deflating.'

- ‘It is very research oriented, everything we learn is always linked to a current research undertaking at the university or elsewhere. I find it very appealing to always have these applications in the back of my mind.’
- ‘Research, research, research! Sometimes I feel like the focus of Harvard science is placed too heavily on students doing research or on the professors own research. On the other hand, this focus on current research is what makes Harvard a Mecca.’
- ‘It is very, very difficult to get to know professors. Science courses are too large and dehumanizing. BUT -- Greg Tucci is amazing, kind, thoughtful, and generally wonderful. In short he is a great mentor.’

When asked for suggestions for specific improvements to the Chemistry concentration, students said the following:

- ‘Smaller classes would be incredibly helpful. Especially some of the introductory ones. I also think that a mentor program would be great -- students should be paired with professors or lecturers and be encouraged to meet with them a couple times a semester.’
- ‘More required practice in scientific writing and oral communication, more venues for students who collaborate with grad students and professors to present their research (most of the venues focus on student-only research).’
- ‘Some of the chemistry legends could interact more with undergraduates.’
- ‘A wider selection of classes. More exposure to research (not courses but in actual labs) as early and as often as possible.’
- ‘I did combine research with an international experience, and it was a very exciting and fun summer. My advisor provided advice on how to go about it, but I was successful by just emailing professors I was interested in. I also wanted to say our Chemistry sophomore tutorial is a perfect way to introduce sophomores to the idea of research, and the different types of research that are going on. Seeing what the cutting edge research being done by Harvard professors is a totally different experience than learning basic chemistry in classes; it changed the way I looked at chemistry. Other concentrations would be advised to adopt something similar (no grades, just professors giving lectures about their research). Finally, I think one of the major issues in our world right now is the energy crisis. Many of my classmates in science, and I, are extremely interested in working in that area, and it’s one of the main reasons we will continue on doing research in our specific fields. While there is a lot at Harvard, (speakers, conferences, resources) on the subject, there is very little targeted at undergraduates. Something like the Graduate consortium for energy and the environment, but tailored to undergrads, would be an excellent way to go about focusing on undergrads, and I believe there would be extremely large participation.’

Computer Science

General Comparisons

Computer science students appeared to be less encouraged to pursue research than the general population (36% vs. 61%). Fewer asserted that research opportunities are easy to find (27% vs. 60%). More CS concentrators reported lack of satisfaction with Harvard's attempts to teach oral communication (45% vs. 25% across concentrations), knowledge of public policy (55% vs. 35%) and ethics of science (55% vs. 34%). However, overall CS students appeared slightly more satisfied with their concentration than other students, both academically and personally.

Demographics

N = 11; 5 female, 6 male; 2 class of 2012, 3 class of 2011, 4 class of 2010, 2 class of 2009. One respondent was from the Class of 2010 at the Extension School.

Concentrations, Secondaries, and Career Interests

Of the respondents, 45% are pursuing a secondary field, including MBB, History, Economics and Sanskrit. Two (18%) are joint concentrators with Mathematics and Music. All but one respondent came to the college planning to study science. One respondent chose CS after being out off by the requirements for BS in Engineering. 82% of respondents are considering a career in applied sciences and 36% think about finance. A few individuals are interested in law or government.

Research Experiences

Research opportunities

55% of the respondents engage in research outside of classroom. 33% do it for 1-5 hours a week and another 33% for 5-10 hours/week. 33% of the respondents came to the College having previously done research at other universities. 44% engaged in summer research on campus, through both PRISE and an REU with Matt Welsh.

73% of all respondents believe that research opportunities are important for science education, while 9% (1 person) openly disagree.²¹ Only 27% think that it is easy to find research opportunities, while 36% disagree. Nonetheless, when asked if there are many research opportunities available at Harvard, 45% agreed and only 27% disagreed. Only 36% declared

²¹ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

being encouraged to conduct research (mostly by professors). Information on funding and research opportunities was received from concentration advisors and HCRP.

Only two individuals presented their research at student conferences or in publications. Around a half of all respondents in CS pursued research at other institutions or considered research abroad. 36% and 55% respectively have looked at research opportunities outside of Harvard and abroad. 64% believe that Harvard does a good job of helping in search for such opportunities. Overall, 73% of responding students declared that research is important for their education, while only one person (i.e. 9%) disagreed.

Problems with research

36% of respondents complained about difficulties in communication with professors.

Academic Experiences

Collaboration and competition

64% believe that science classes are more competitive than non-science ones (a relatively low percentage), while 27% disagree. More respondents report collaboration with peers in concentration classes (91%) than in non-concentration ones (27%). 45% do not collaborate with peers in non-concentration classes.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	82%	55%	0%	27%
Oral Communication	100%	36%	0%	45%
Knowledge of current scientific literature	82%	64%	0%	18%
Knowledge of public policy	36%	36%	27%	55%
Ethics of science	45%	36%	27%	55%
Knowledge of other scientific fields	64%	45%	9%	18%

Note: The low rating on preparation in ethics and public policy appears to be a shared characteristic of science concentrations.

General Experiences

Satisfaction with concentration and Harvard as a whole

91% of the respondents were academically satisfied with CS as a concentration. 73% expressed personal satisfaction with their concentration, while 18% were unsatisfied. Similarly, Harvard is rated as personally and academically satisfying by 91% and 82%, respectively. The other students are unsatisfied.

Concentration resources

64% of the respondents know a faculty member from their concentration reasonably well. 82% feel that Harvard directs enough resources to the concentration.

Qualitative observations

The qualitative comments generally reflect the feeling that although Harvard has a significant population of pre-professional students, it is well suited to many types of students. The comments below are a selection of the comments on Harvard science in general:

- “The programmers, engineers, and mathematicians are all friends. Applied mathematicians are unfriendly and are unwilling to help you with a problem.”
- “Among undergrads, science is mostly about problem sets and self-pity.”
- “There are a lot of people working on various small projects, but insufficient collaboration between groups.”
- “Physics has proven extremely collaborative.”

CS – specific comments:

- “Computer Science is the concentration with the most personal touch; it is fun and has an amazing community spirit. Please fund the department better in order to hire more faculty members and offer more interdisciplinary classes with a CS component.”
- “Instructors need better integration of technology instruction. TA/TF need more training in standing before a group/instructing.”
- “[CS needs] better advising. Upperclassmen and grad students sometimes seem better at giving advice than professors”
- “There should be an engineering degree that shows that you took lots of EE and CS courses [...] I can't consider the engineering degree, because it has such a smaller number of CS courses.”
- “[...] the College kids really [don't know about the Extension School students] with industry experience and connections. [...] I don't get the impression HC students talk regularly with professors or even visit just [to chat].”

Earth and Planetary Science

General comparisons

While each science and mathematics concentration is different, here we provide some comparisons between mathematics concentrators and the overall response from all science concentrators. Compared to the overall average of 49%, 67% of EPS concentrators have done research at the College, and 89% think it is easy to find research opportunities compared to the science concentrator average of 60%. Only 44% of EPS concentrators find science classes more competitive than non-science ones, while 74% of science concentrators think this is true. All EPS concentrators are personally satisfied with their concentration, compared to 71% in general. This may be partly caused by the fact that all concentrators feel they have at least one faculty member who cares about them, compared to 62% among science concentrators in general.

Demographics

N = 9; 6 female, 3 male; 0 class of 2012, 1 class of 2011, 3 class of 2010, 6 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 44% are pursuing a secondary field, listed as Government, Economics, Folklore and Mythology, and Astronomy/Astrophysics. A strong majority (78%) of respondents are considering going into a career in the physical sciences; 33% are also considering applied science/engineering and consulting/finance.

Research Experiences

Research opportunities

While only one student came to the College having previously done research, 67% of respondents have done research while here, all in the Department. 5 of the 6 that have done research spend 6-10 hours per week on the research. 78% of respondents believe that research opportunities are important for science education.²²

89% of respondents think that it is easy to find research opportunities at Harvard and that there are many research opportunities available, while 11% disagree with both statements. 56% believe that their education is better enhanced in the laboratory than the classroom, while 22% disagree. 67% believe that there is ample opportunity to present research. 56% were encouraged to pursue research, primarily by professors and teaching fellows, but also by friends and a freshman adviser.

44% have pursued summer research, through field research, HCRP, PRISE and Herschel Smith. 89% of respondents look to their concentration adviser for information about research

²² When percentages do not sum to 100%, the remaining respondents were neutral on the question.

opportunities and funding. 67% of respondents have pursued science opportunities outside Harvard, have found Harvard helpful in obtaining those opportunities, and have considering combining their research with an international experience. Only 22% have engaged in research at other Harvard schools.

33% of respondents presented research at Harvard, through the Boston Undergraduate Research Symposium (BURS), the Department senior thesis presentation, or PRISE. One attended student science activities through BURS, and none published in an undergraduate science journal.

Problems with research

33% of students had trouble establishing and/or maintaining contact with a research professor. Only one student had issues with working in a laboratory without a clear intellectual goal and problems finding funding.

Academic Experiences

Collaboration and competition

44% believe that science classes are more competitive than non-science ones, while 11% disagree. All respondents agree that they collaborate with peers in their concentration, while only 56% agree that they do with non-concentration peers. 22% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	89%	56%	0%	44%
Oral Communication	100%	56%	0%	44%
Knowledge of current scientific literature	100%	56%	0%	22%
Knowledge of public policy	89%	44%	0%	22%
Ethics of science	44%	11%	22%	44%

Knowledge of other scientific fields	78%	67%	11%	11%
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General Experiences

Satisfaction with concentration and Harvard as a whole

89% of respondents are academically satisfied with Earth and Planetary Sciences as their concentration, while 100% are personally satisfied with it. In contrast, 78% are academically satisfied with Harvard as a whole, while 11% are not. 67% are personally satisfied with Harvard, and 22% are not.

Concentration resources

All of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. All also feel that Harvard directs enough resources to the concentration,

Qualitative observations

While there was a general feeling that ‘pre-professional’ ‘sociopaths’ dominate Harvard as a whole, concentrators generally found that the science culture was positive. Some characterizations include:

- ‘...students in science concentrations believe that academics are very important and spend a lot of time on coursework and research... We all have high hopes for the future and believe that what we are doing is important.’
- ‘EPS at least is great. Everyone is extremely friendly and welcoming.’
- ‘I have had wonderful experiences with fellow students in my problem set classes. We all help each other out.’
- ‘EPS is the best ever.’
- ‘Hard working smart people’
- ‘Collaborative, theoretical’

Asked for suggestions for specific improvements, the characteristic response was ‘No. EPS is an awesome concentration. I love it’ and ‘I love EPS!!! It's perfect in every way.’ The three suggestions made were:

- Changing the chemistry requirement
- Fewer redundant topics within classes in related fields, i.e. EPS 132 and 133
- Fewer concurrent classes

Engineering Sciences AB

General Comparisons

Assuming a representative sample, Engineering AB students do not find it as easy as the general science student body to find research opportunities (43% v 60% overall). Similarly half of the Engineering AB students had trouble establishing or maintaining contact with a research professor and 29% had trouble finding funding, compared to the overall figures of 36% and 20%, respectively. Regarding academic experiences, 93% of Engineering AB students find science classes more competitive than non-science, compared to 74% of students overall. On a positive note, the Engineering AB students report academic and personal satisfaction with their concentration and Harvard in general at levels comparable to the overall science student body. The last notable comparison is that only 57% of Engineering AB concentrators feel that Harvard directs enough resources to their concentration, versus 76% of students in the general science body who believe that Harvard provides enough to their respective concentrations.

Demographics

N = 14; 9 female, 4 male, 1 undisclosed; 4 class of 2012, 3 class of 2011, 4 class of 2010, 2 class of 2009, 1 undisclosed.

Concentrations, Secondaries, and Career Interests

All of the students report starting out college with the intention to concentrate in a scientific field. 57% (8) are pursuing a secondary field in a diverse cross-section of areas, including Math, Computer Science, Economics, Chemistry, EPS, VES, and HAA. When asked to select one or more potential career options, the three most popular responses were applied sciences or engineering (86%), medicine or healthcare (57%) and life sciences (43%).

Research Experiences

Research opportunities

Five students (36%) report having done lab research before college, and the same number report doing research in college. 80% of those who do research spend 6-10 hours per week on the research. 79% of respondents believe that research opportunities are important for science education.²³

Only 43% of respondents think that it is easy to find research opportunities and that there are many such opportunities available, whereas 29% disagree with both statements. 71% believe that their engineering education is better enhanced in the laboratory than the classroom, while 7% disagree. 29% believe that there is ample opportunity to present research. 57% were encouraged

²³ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

to pursue research, primarily by professors (like Marko Loncar and Jim Anderson) and teaching fellows, but also by friends and freshman/sophomore advisers.

29% have pursued summer research, through PRISE and off-campus REUs. 43% of respondents look to their concentration adviser for information about research opportunities and funding and 50% look to e-mail listservs for the information. Between one-third and two-thirds of respondents have pursued science opportunities outside Harvard (64%), have found Harvard helpful in obtaining those opportunities (36%), and have considering combining their research with an international experience (64%). Only two students (14%) have engaged in research at other Harvard schools.

Problems with research

Half of the students had trouble establishing and/or maintaining contact with a research professor. One student reported performing unstimulating lab work, and four students (29%) had problems finding funding.

Academic Experiences

Collaboration and competition

93% believe that science classes are more competitive than non-science ones, while 7% disagree. Again, 93% of respondents agree that they collaborate with peers in their concentration, while only 50% agree that they do with non-concentration peers. 36% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	93%	43%	7%	21%
Oral Communication	100%	50%	0%	21%
Knowledge of current scientific literature	86%	50%	14%	21%
Knowledge of public policy	71%	36%	7%	29%

Ethics of science	57%	21%	14%	29%
Knowledge of other scientific fields	86%	57%	7%	7%

General Experiences

Satisfaction with concentration and Harvard as a whole

79% of respondents are academically satisfied with Engineering Sciences AB as their concentration, and 71% are personally satisfied with it. In contrast, 64% are academically satisfied with Harvard as a whole, while 21% are not. 71% are personally satisfied with Harvard, and 21% are not.

Concentration resources

Half of the respondents report knowing at least one faculty member in the concentration reasonably well and who they feel cares about them. These professors were met mostly through research, but some were also met through class. Only 57% feel that Harvard directs enough resources to the concentration; those few who feel otherwise argue that the undergraduate engineering program needs higher quality advising, teaching, and general attention to provide a holistic experience for undergraduates.

Qualitative observations

Engineering sciences AB concentrators found that the overall culture of science at Harvard was intense and somewhat competitive. Some characterizations include:

- ‘Science at Harvard is based on the pure sciences: chemistry, physics, biology, and math. Many of the science concentrators are pre-med; those who are no are interested mostly in studying their field, rather than applying science to practical problems.’
- ‘I am glad it embraces undergraduate research (both science and non-science).’
- ‘Competitive. However, once you get to upper level classes, people relax a little more.’

When asked for suggestions for specific improvements to the Engineering Sciences AB concentration, students said the following:

- ‘I don't think I know enough about my concentration to offer suggestions. I do think it's interesting how I've only seen my concentration advisor once--and that was for her to sign my study card.’
- ‘There were very, very few courses offered this year compared to the number that were supposed to be offered. I am graduating and did not get the chance to even shop most of the courses I was really interested in.’

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

- ‘More time teaching the basics? Not everyone comes in at the same level, but I think it's always good to have a short review.’
- ‘I think the engineering concentration needs to have more/easier access to research opportunities. I believe it should also have more courses that allow students to do their own engineering design work.’

Engineering Sciences SB

General Comparisons

Assuming a representative sample, proportionally-speaking, fewer Engineering SB students pursue secondary fields (24% versus 47% in the general science student body). Fewer students (47%) agree that there are many research opportunities available than in the general science student body (62%). In spite of this, more Engineering SB students (59%) believe that their education is better enhanced in the laboratory than in the classroom, compared to 47% in the undergraduate science community. Regarding academics, 100% of Engineering SB respondents report that they collaborate with their concentration peers compared to 86% in the undergraduate science population. In terms of skill development, all respondents regard knowledge of other scientific fields as important (compared to 68% in the general science student body) and, interestingly, 71% feel that Harvard does not help teach them oral communication skills (compared to 51% in the general science student body). Similar to that of Engineering AB concentrators, only 59% of Engineering SB concentrators feel that Harvard directs enough resources to their concentration, versus 76% of students in the general science body who believe that Harvard provides enough to their respective concentrations.

Demographics

N = 17; 10 female, 7 male; 7 class of 2012, 5 class of 2011, 3 class of 2010, 2 class of 2009.

Concentrations, Secondaries, and Career Interests

All of the students report starting out college with the intention to concentrate in a scientific field. Only 24% (4 students) are pursuing a secondary field in a diverse cross-section of areas, including Computer Science, Economics, and Chemistry. This low proportion is likely due to the time constraints facing SB concentrators. When asked to select one or more potential career options, the three most popular responses were applied sciences or engineering (94%), medicine or healthcare (65%) and business (35%).

Research Experiences

Research opportunities

Eight students (47%) report having done lab research before college and six (35%) report doing research in college. 50% of those who do research spend 1-5 hours per week on the research. 82% of respondents believe that research opportunities are important for science education.²⁴

Only 53% of respondents think that it is easy to find research opportunities and 47% think that there are many such opportunities available, whereas 29% disagree with both statements. 59%

²⁴ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

believe that their engineering education is better enhanced in the laboratory than the classroom, while 18% disagree. 35% believe that there is ample opportunity to present research. 71% were encouraged to pursue research, primarily by professors (like Marie Dahleh and Richard Losick) and upperclassmen.

24% have pursued summer research, through PRISE and off-campus REUs. Only 29% of respondents look to their concentration adviser for information about research opportunities and funding and 53% look to e-mail listservs for the information. Many of the respondents have pursued science opportunities outside Harvard (59%), found Harvard helpful in obtaining those opportunities (41%), and considered combining their research with an international experience (88%). Only four students (24%) have engaged in research at other Harvard schools.

35% of respondents presented research at Harvard, through HURS, BURS, and PRISE. Five attended student science activities, and one published in an undergraduate science journal.

Problems with research

35% of the students had trouble establishing and/or maintaining contact with a research professor. One student reported performing unstimulating lab work, and five students (29%) had problems finding funding.

Academic Experiences

Collaboration and competition

82% believe that science classes are more competitive than non-science ones, while 6% disagree. 100% of respondents agree that they collaborate with peers in their concentration, while only 29% agree that they do with non-concentration peers. 47% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	94%	24%	0%	18%
Oral Communication	94%	71%	0%	12%

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

Knowledge of current scientific literature	88%	24%	0%	12%
Knowledge of public policy	71%	24%	6%	29%
Ethics of science	88%	18%	12%	24%
Knowledge of other scientific fields	100%	71%	0%	6%

General Experiences

Satisfaction with concentration and Harvard as a whole

76% of respondents are academically satisfied with Engineering Sciences SB as their concentration, and 71% are personally satisfied with it. In contrast, 65% are academically satisfied with Harvard as a whole, while 24% are not. 59% are personally satisfied with Harvard, and 12% are not.

Concentration resources

Nine (53%) of the respondents report knowing at least one faculty member in the concentration reasonably well and who they feel cares about them. These professors were met mostly through research, but some were also met through class. Only 59% feel that Harvard directs enough resources to the concentration; those who feel otherwise argue that the undergraduate engineering program needs more and better advising and resources (one example is the lack of access to SolidWorks).

Qualitative observations

Engineering sciences SB concentrators found that the overall culture of science at Harvard was intense but collaborative. Some characterizations include:

- ‘Science at Harvard is under appreciated as students in science have more work and receive less praise than their humanities and social science peers.’
- ‘It is collaborative -- students work together to finish problem sets and study for classes, especially in physics and math.’
- ‘Science is a little diluted, but you can find science people. it's great because the science students are not JUST science students...they love other subjects as well...overall, well balanced.’

When asked for suggestions for specific improvements to the Engineering Sciences SB concentration, students said the following:

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

- ‘More hands-on work. More team projects. More courses.’
- ‘Advising. For the Engineering BS program, it is really hard to start at the bottom. The only way that I really won't graduate in 5 years is by taking summer school. I have no elective as well. I feel as though the Engineering BS is a little disorganized.’
- ‘More biomedical engineering courses - order the better biomedical engineering textbooks to the Harvard coop...there's maybe one BioE book there...also make curriculum that caters to BioMe majors in the next year or two.’
- ‘Better communication between professors/administrators and the students. Better advising for freshmen. Opportunities need to be available for freshmen to get a taste of engineering.’

Human Evolutionary Biology

General Comparisons

HEB concentrators are clearly mostly pre-meds. They are more likely to pursue a secondary field than other students (64% vs. 47%). It seems that the proportion of HEB concentrators interested in research is generally lower than in other science concentrations, with only 50% declaring that research is important for their scientific education (vs. 81% overall). HEB students engaging in research do so for a relatively shorter time: 16% spend less than 10 hours per week on research, as compared to 53% in the general population. At the same time HEB students are less intensively encouraged to pursue research (49% vs. 61%) and report problems with research funding or communicating with mentors more frequently.

HEB concentrators appear much more satisfied with Harvard's efforts to teach scientific writing (86% vs. 55% across concentrations), oral communication (64% vs. 51%), knowledge of current literature (93% vs. 59%), public policy (57% vs. 31%), and knowledge of other scientific fields (79% vs. 63%).

Demographics

N = 14; 10 female, 4 male; 3 class of 2012, 2 class of 2011, 6 class of 2010, 3 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 64% are pursuing a secondary field, mostly in humanities (Drama, Philosophy) and social sciences (including Public Health, Government, Economics). A strong majority came to the college planning to study science. 86% of respondents are considering becoming doctors; A third is also considering other life sciences, while a few individuals consider finance or government.

Research Experiences

Research opportunities

43% of the respondents came to the College having previously done research and the same proportion (although not necessarily the same persons) have done research at Harvard. Only 29% engaged in summer research on campus, mostly through PRISE. While the research before college was conducted at a variety of medical schools and biomedical science departments, the experiences at Harvard are both at the Medical School and the Psychology Department. 84% of respondents spend no more than 10 hours per week on this activity.

Only 50% of all respondents believe that research opportunities are important for science education, while 17% openly disagree.²⁵ This may be linked to the fact that only 57% think it is easy to find research opportunities at Harvard. Slightly less than a half was encouraged to pursue research. Those who were got their encouragement from advisors, professors, friends and a Kirkland house tutor. Students invariably turned to the HCRP and email listservs (e.g. OCS) for information on research opportunities and funding.

Only two individuals presented their research at student conferences or in publications. Around a half of all respondents in HEB pursued research at other institutions or considered research abroad.

Strangely, 71% agree that research opportunities are plentiful. It is interesting that 36% consider research opportunities more important for scientific education than class work, while 50% are neutral.

Problems with research

Of the group that conducted research at Harvard, most reported problems with communication, funding opportunities or un-stimulating labwork.

Academic Experiences

Collaboration and competition

93% believe that science classes are more competitive than non-science ones, while only one person (the remaining 7%) disagrees. More respondents report collaboration with peers in concentration classes (93%) than in non-concentration ones (50%). 14% do not collaborate with peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	71%	86%	7%	0%
Oral Communication	100%	64%	0%	7%
Knowledge of current scientific literature	93%	93%	0%	7%

²⁵ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

Knowledge of public policy	100%	57%	0%	29%
Ethics of science	93%	36%	7%	14%
Knowledge of other scientific fields	79%	79%	14%	0%

Note: The low rating on preparation in ethics and public policy appears to be a shared characteristic of science concentrations.

General Experiences

Satisfaction with concentration and Harvard as a whole

79% of the respondents were academically satisfied with HEB as a concentration. 86% expressed personal satisfaction with their concentration. Similarly, Harvard is rated as personally and academically satisfying by 86% and 93%, respectively. Only one person seems to be generally displeased with their life at Harvard.

Concentration resources

71% of the respondents know a faculty member reasonably well and feel that Harvard directs enough resources to the concentration.

Qualitative observations

The qualitative comments generally reflect the feeling that Harvard is not particularly dominated by any single group, although the presence of pre-medical and pre-professional students is very noticeable. The comments below are a selection of the comments on scientific experiences in general and on HEB:

- “I came from a rural area with very few academic challenges and it has been difficult for me to compete and feel comfortable with students who have stronger backgrounds, especially in research.”
- “Harvard has a hard time supporting students who may not start off on a level [of students prepared well in high school].
- “It would be nice if there were a few more full faculty members [in HEB].”
- “HEB could be improved by having a larger number of courses both in the spring and the fall semesters. Other than that, the concentration is great!”
- “[Need] more classes available at more times”
- ” I love my concentration. If the pre-med culture could be improved at all that would be fabulous. I am happy that there is a Science A course now.”
- ” They should be more supportive and helpful when I come with questions or ideas.”

Joint Concentrations

General comparisons

While each science and mathematics concentration is different, here we provide some comparisons between joint concentrators and the overall response from all science concentrators. While 49% of science concentrators have done research at Harvard, only 33% of joint concentrators have. However, joint concentrators have had little to no trouble with their research (contacting professors, finding funding, etc.), compared to the average science concentrator. Compared to 74% overall, only 33% of joint concentrators think science classes are more competitive than non-science ones. 78% of joint concentrators feel they have at least one faculty member who cares about them, greater than the 62% overall.

Demographics

N = 9; 1 female, 8 male; 3 class of 2012, 2 class of 2011, 3 class of 2010, 1 class of 2009
5 Physics and Math, 1 Physics and History of Science, 1 Math and Philosophy, 1 Chem/Phys and Math, 1 Physics and Engineering Sciences

Concentrations, Secondaries, and Career Interests

Of the respondents, 44% are pursuing a secondary field in either Mind, Brain and Behavior or Computer Science. 89% are considering going in the physical sciences.

Research Experiences

Research opportunities

One respondent came to the College having previously done research. 33% have done research while attending the College, through a variety of Harvard departments. 67% of researchers spend 6-10 hours per week on research, and 33% spend 11-15 hours. 78% of respondents believe that research opportunities are important for science education, while 11% disagree.²⁶

56% of respondents think that it is easy to find research opportunities at Harvard. 33% think that their education is better enhanced in the laboratory than the classroom, while 33% disagree. 78% think there are many research opportunities at Harvard. 56% were encouraged to pursue research, primarily by professors, advisers and fellow students.

33% have pursued summer research, through an REU or an off-campus project. 67% of respondents look to HCRP/SEO and their concentration advisers for information about research opportunities and funding. 44% of respondents have pursued science opportunities outside Harvard, 56% have found Harvard helpful in obtaining those opportunities, and 44% have

²⁶ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

considering combining their research with an international experience. None had engaged in research at other Harvard schools.

One respondent presented research at Harvard through a group meeting. One attended student science activities (HURS 2008). None have published in an undergraduate science journal.

Problems with research

One student had trouble establishing and/or maintaining contact with a research professor. None had issues with working in a laboratory without a clear intellectual goal and problems finding funding, and one student had trouble finding funding.

Academic Experiences

Collaboration and competition

33% believe that science classes are more competitive than non-science ones, while 22% disagree. 78% of respondents agree that they collaborate with peers in their concentration, while only 22% agree that they do with non-concentration peers. 56% do not collaborate with non-concentration peers, and 22% do not collaborate with concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	78%	33%	11%	33%
Oral Communication	100%	44%	0%	22%
Knowledge of current scientific literature	67%	44%	11%	22%
Knowledge of public policy	78%	33%	0%	22%
Ethics of science	89%	33%	22%	22%
Knowledge of other scientific fields	100%	44%	0%	22%

General Experiences

Satisfaction with concentration and Harvard as a whole

78% of respondents are academically and personally satisfied with their Joint concentration, while 11% are neither academically nor personally satisfied. 89% are academically satisfied with Harvard as a whole, and 100% are personally satisfied with Harvard as a whole.

Concentration resources

78% of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. 89% feel that Harvard directs enough resources to the concentration.

Qualitative observations

Asked about the type of student that dominates Harvard, most responses were similar to the following two:

- ‘Harvard is definitely dominated by pre-professionals who plan to go into finance/consulting. Most of the resources (e.g. OCS) reflect this.’
- ‘I feel like Harvard is a large and diverse enough institution to support both pre-academic and pre-professional students, and that there is not necessarily a sharp dividing line between these two types.’

There was a general positive opinion about the culture of science at Harvard:

- ‘Competitive yet friendly among peers; supportive yet demanding from professors: a strong and unique balance.’
- ‘The culture of higher math classes and physical sciences is interactive and collaborative. There is curiosity and excitement. There is also a drive to think about problem set and pass the class to the exclusion of anything not grade related.’
- ‘The culture of science at Harvard is generally good. I do feel that physics seems a bit more oriented to its grad students but I think Morin and Georgi are doing a good job changing that.’

Suggested specific improvements for the department:

- Better ties between math and physics
- More international opportunities for research
- Clearer prerequisites
- More engagement between professors and students

Mathematics

General comparisons

While each science and mathematics concentration is different, here we provide some comparisons between mathematics concentrators and the overall response from all science concentrators. While 49% of science concentrators have done research at Harvard, only 28% of mathematics concentrators have. This may be because only 44% of math concentrators think it is easy to find research opportunities at Harvard, while 60% overall believe this statement to be true. Interestingly, 61% of math concentrators have pursued summer research, compared to 36% overall. While 74% of science concentrators think that science classes are more competitive than non-science ones, only 39% of math concentrators agree.

Demographics

N = 18; 3 female, 15 male; 3 class of 2012, 3 class of 2011, 6 class of 2010, 6 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 61% are pursuing a secondary field. The most common secondary fields are computer science and English (3 respondents each), but range from music to statistics. A plurality (44%) are considering going into mathematics through Academia; 33% are also considering consulting or finance.

Research Experiences

Research opportunities

44% of the respondents came to the College having previously done research, mostly through RSI or research at a local university. 28% have done research while attending the College, through a variety of venues. Researchers spend either 1-5 or 6-10 hours per week on research. 78% of respondents believe that research opportunities are important for science education, while 17% disagree.²⁷

44% of respondents think that it is easy to find research opportunities at Harvard, while 33% disagree. 33% think that their education is better enhanced in the laboratory than the classroom and that there are many research opportunities at Harvard, while 44% disagree with the former statement and 39% disagree with the latter. 39% were encouraged to pursue research, primarily by professors. Salil Vadhar and Economics Professor Edward Glaeser were specifically mentioned.

61% have pursued summer research, mostly through REUs and PRISE. The largest majority, 50% of respondents, look to HCRP/SEO for information about research opportunities and

²⁷ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

funding. Only 39% looks to concentration advisers. 61% of respondents have pursued science opportunities outside Harvard, 39% have found Harvard helpful in obtaining those opportunities, and 39% have considering combining their research with an international experience. Only 22% have engaged in research at other Harvard schools.

39% of respondents presented research at Harvard, mainly through HURS and off-campus conferences. 28% attended student science activities (HURS and BURS) and 17% published in an undergraduate science journal (Harvard College Mathematics Journal).

Problems with research

33% of students had trouble establishing and/or maintaining contact with a research professor. 11% had issues with working in a laboratory without a clear intellectual goal and problems finding funding, and one student had trouble finding funding.

Academic Experiences

Collaboration and competition

39% believe that science classes are more competitive than non-science ones, while 44% disagree. 83% of respondents agree that they collaborate with peers in their concentration, while only 17% agree that they do with non-concentration peers. 17% do not collaborate with concentration peers and 56% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	83%	50%	6%	33%
Oral Communication	94%	56%	0%	39%
Knowledge of current scientific literature	94%	61%	0%	28%
Knowledge of public policy	39%	17%	33%	50%
Ethics of science	39%	6%	39%	61%
Knowledge of other scientific fields	83%	89%	6%	0%

General Experiences

Satisfaction with concentration and Harvard as a whole

83% of respondents are academically satisfied with Mathematics as their concentration, while 94% are personally satisfied with it. 11% are not academically satisfied and 6% are not personally satisfied. In contrast, 89% are academically satisfied with Harvard as a whole, while 0% are not. 61% are personally satisfied with Harvard, and 28% are not.

Concentration resources

67% of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. 89% feel that Harvard directs enough resources to the concentration.

Qualitative observations

Three general views about the type of student that dominates Harvard were present, best encapsulated in three different student responses:

- ‘I feel overwhelmed by the jock gov/ec concentrators, future analysts and bankers, and people who run all sorts of random clubs and parties. I miss the good old days of math contests.’
- ‘Harvard is attuned to students who are not afraid to knock on doors.’
- ‘Pre-professional, pre-law, and pre-med students dominate the university. Research is dominated by pre-med and pre-"academic graduate school" students.’

Similarly, opinions about the culture of science and math at Harvard could be described by one of the following statements:

- ‘I love the way that intellectual curiosity is so central to math culture at Harvard. There's a bit too much competitiveness sometimes, but it's mostly under control.’
- ‘Occasionally I feel like science at Harvard is not on equal grounds with the humanities. The Core, I think, is biased towards the humanities, and I would say there are fewer science-related events organized by the College.’
- ‘Intense, and proud of its intensity. There is an expectation that you should always be sleep deprived.’

Suggested specific improvements for the department:

- Better advising
- More faculty-student interactions, especially for students who do not take Math 55

Undergraduate Science Experiences at Harvard College
Academic Year 2008-2009

- 'Adopting the Princeton sequences in Analysis taught using Stein's books: Fourier Analysis, Complex Analysis'
- Clearer expectations for courses
- More classes
- More 'math pride' and interactions between concentrators
- More research opportunities for freshmen

Molecular and Cellular Biology

General Comparisons

Demographics:

Of the 406 total respondents, 57 are concentrators in Molecular and Cellular Biology (MCB). While 95% of MCB respondents are considering a career in medicine or healthcare, only 55% overall respondents are considering this career path. 60% of MCB respondents and 34% of overall respondents are considering a career in the life sciences.

Research Opportunities:

While 49% of the overall respondents have done research at Harvard, 65% of MCB respondents took part in research. 81% of overall respondents and 78% of MCB respondents believe that research opportunities are important for science education. 63% of MCB respondents think that it is easy to find research opportunities at Harvard, only 60% of respondents agree. 72% of MCB respondents believe that there are ample opportunities to present research at Harvard, while only 47% of overall respondents feel the same. In addition, 49% of MCB respondents 36% of overall respondents have pursued summer research. While the majority of overall respondents (56%) look to HCRP/SEO for information about research opportunities and funding, a 65% majority of MCB respondents look to their concentration advisor. 28% of MCB respondents and 23% of overall respondents have presented research at Harvard. 7% of MCB respondents and 8% of overall respondents have been published in an undergraduate science journal.

Academic Experiences:

79% of MCB respondents and 74% of overall respondents believe that science classes are more competitive than non-science classes. 86% of MCB respondents and overall respondents concentrate with their peers in their concentration, while 58% of MCB respondents and 51% of overall respondents collaborate with their non-concentration peers. 89% of MCB respondents believe the ethics of science are important for their future and 39% indicate that Harvard provides this information. In contrast, 74% of overall respondents believe that the ethics of science are important to their future and 26% of respondents believe that Harvard provides this information. Similarly, 79% of MCB respondents believe that knowledge of other scientific fields are important and 60% of MCB respondents believe that Harvard provides this knowledge. On the other hand, 68% of overall respondents believe that knowledge of other scientific fields are important and only 63% of overall respondents believe that Harvard provides this information.

General Experiences:

79% of MCB respondents and 74% of the overall respondents are satisfied with their concentration, whereas 63% of MCB respondents and 71% of overall respondents are personally satisfied with their concentration. Moreover, 86% of MCB respondents are academically satisfied with Harvard as a whole and 75% are personally satisfied with Harvard as a whole. 80% of overall respondents are academically satisfied with Harvard and 73% of respondents are personally satisfied with Harvard as a whole. While 89% of MCB respondents feel that Harvard

directs enough resources to their concentration, 76% of overall respondents feel that Harvard directs enough resources to their concentration.

Demographics

N = 57; 35 female, 22 male; 17 class of 2012, 23 class of 2011, 13 class of 2010, 4 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 56% are pursuing a secondary field, listed as Health Policy, Psychology, Germanic Languages and Literature, French Languages and Literature, Spanish, Microbial Sciences, Music, Philosophy, Government, Computer Science, Economics, Archaeology, East Asian Studies, History of Art and Architecture, Anthropology, Linguistics, and Physics. A strong majority (95%) of respondents are considering going into a career in medicine or healthcare; 60% are considering a career in life sciences and 11% are considering a career in applied science or engineering.

Research Experiences

Research opportunities

65% of respondents have done research while at Harvard. Of these respondents, 14 have done research at Harvard Medical School and 9 have done research in the MCB Department. 10 respondents spend 6-10 hours per week on research, 12 respondents spend 11-15 hours per week on research, and 5 respondents spend 16-20 hours per week on research. 78% of respondents believe that research opportunities are important for science education.

63% of respondents think that it is easy to find research opportunities at Harvard, while 2% disagree. 72% believe that there are many research opportunities available, while 4% disagree. 60% believe that their education is better enhanced in the laboratory than the classroom, while 7% disagree. 72% believe that there is ample opportunity to present research. 74% were encouraged to pursue research, primarily by professors, teaching fellows, and freshmen advisers, but also by house tutors and a proctor.

49% have pursued summer research, through HSCI, PRISE, and Herschel Smith. 65% of respondents look to their concentration adviser for information about research opportunities and funding, while 46% look to e-mail listservs. 61% of respondents have pursued science opportunities outside Harvard, 58% have found Harvard helpful in obtaining those opportunities, and 79% have considering combining their research with an international experience.

28% of respondents presented research at Harvard, through the Boston Undergraduate Research Symposium (BURS), the Department senior thesis presentation, or PRISE. 7% of respondents have been published in an undergraduate science journal.

Problems with research

33% of students had trouble establishing and/or maintaining contact with a research professor and 2% of students had issues with working in a laboratory without a clear intellectual goal. 19% of students had problems finding funding.

Academic Experiences

Collaboration and competition

79% believe that science classes are more competitive than non-science ones, while 5% disagree. 86% of respondents agree that they collaborate with peers in their concentration, while 58% agree that they do with non-concentration peers. 23% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	96%	68%	2%	11%
Oral Communication	84%	47%	2%	18%
Knowledge of current scientific literature	91%	77%	2%	5%
Knowledge of public policy	84%	37%	2%	40%
Ethics of science	89%	39%	2%	35%
Knowledge of other scientific fields	79%	60%	5%	18%

General Experiences

Satisfaction with concentration and Harvard as a whole

79% of respondents are academically satisfied with Molecular and Cellular Biology as their concentration, while 63% are personally satisfied with it. 86% are academically satisfied with Harvard as a whole, while 9% are not. 75% are personally satisfied with Harvard, and 7% are not.

Concentration resources

51% of respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. 89% feel that Harvard directs enough resources to the concentration.

Qualitative observations

There was a general feeling that ‘pre-professional’ and ‘pre-academic’ students dominate Harvard as a whole and concentrators generally characterize the science culture as competitive. Some characterizations include:

- ‘Science at Harvard is very independent. You get out what you put in’
- ‘The culture of science at Harvard is about getting it right and getting it now. We are almost expected to understand concepts by the first time.’
- ‘Science at Harvard is overwhelming.’
- ‘Science...is intense. There is an unspoken competition amongst all of us for a limited number of spots.’
- ‘A lot of genuinely curious, passionate people who love to learn and do amazing things.’

Asked for suggestions for specific improvements, the responses included:

- ‘Please screen professor and TFs better.’
- ‘I think it would be helpful if there weren’t life science tracks within math, physics, and organic chemistry, because their purposes seem unclear.’
- ‘I would like smaller classes and more discussion-based learning’
- ‘To the advisors – please tell it like it is...a mismatched concentration will cause great strife and anguish’

Neurobiology

General Comparisons

Demographics:

Of the 406 total respondents, 43 are concentrators in Neurobiology. A 55% majority of overall respondents and a 77% majority of Neurobiology respondents are considering a career in medicine or healthcare, followed by 34% of overall respondents and 53% of Neurobiology respondents considering a career in life science.

Research Opportunities:

49% of the overall respondents and 60% of Neurobiology respondents have done research while at Harvard. 47% of overall body of respondents who took part in research indicated that they spent 6-10 hours per week doing research. 54% of Neurobiology students taking part in research similarly indicated that they spent 6-10 hours per week doing research. Likewise, 81% of overall respondents and 91% of Neurobiology respondents believe that research opportunities are important for science education. 67% of Neurobiology and 60% of overall respondents think that it is easy to find research opportunities at Harvard. In addition, 37% of Neurobiology respondents and 36% of overall respondents have pursued summer research. A majority (56%) of overall respondents look to HCRP/SEO for information about research opportunities and funding, whereas the majority (63%) of Neurobiology respondents look to their concentration advisors. 81% of Neurobiology respondents and 65% of overall respondents have considered combining their research with an international experience. 26% of Neurobiology respondents and 23% of overall respondents have presented research at Harvard. Moreover, 19% of Neurobiology respondents have been published in an undergraduate science journal, as opposed to the 8% of overall respondents who have been accordingly published.

Academic Experiences:

84% of Neurobiology respondents and 74% of overall respondents believe that science classes are more competitive than non-science classes. 93% of Neurobiology respondents collaborate with their peers in their concentration, whereas 86% of overall respondents concentrate with their peers in their concentration. 93% of Neurobiology respondents believe that knowledge of current scientific literature is important and 77% indicate that Harvard provides this information. In contrast, only 84% of overall respondents believe that knowledge of current scientific literature is important and 59% of respondents believe that Harvard provides this information. Similarly, 81% of Neurobiology respondents believe that knowledge of other scientific fields are important and 72% of Neurobiology respondents believe that Harvard provides this knowledge. On the other hand, 68% of overall respondents believe that knowledge of other scientific fields are important and only 63% of overall respondents believe that Harvard provides this information.

General Experiences:

While 70% of Neurobiology respondents are satisfied with Neurobiology as their concentration, 74% of the overall respondents are satisfied with their concentration. 70% of Neurobiology respondents and 70% of overall respondents are personally satisfied with their concentration.

Moreover, 84% of Neurobiology respondents are academically satisfied with Harvard as a whole and 70% of Neurobiology respondents are personally satisfied with Harvard as a whole. 80% of overall respondents are academically satisfied with Harvard and 73% of respondents are personally satisfied with Harvard as a whole.

Demographics

N = 43; 32 female, 11 male; 15 class of 2012, 11 class of 2011, 13 class of 2010, 4 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 42% are pursuing a secondary field, listed as Mathematical Science, Romance Languages and Literature, Psychology, Medical Anthropology, Government, and Economics. A majority (77%) of respondents are considering going into a career in medicine or healthcare; 53% are considering a career in life sciences and 16% are considering a career in business.

Research Experiences

Research opportunities

60% of respondents have done research while at Harvard. Of these respondents, 8 have done research at Harvard Medical School and 6 have done research in the MCB Department. 54% of respondents spend 6-10 hours per week on research, while 23% of respondents spend 11-15 hours per week on the research. 91% of respondents believe that research opportunities are important for science education.

67% of respondents think that it is easy to find research opportunities at Harvard, while 12% disagree. 79% believe that there are many research opportunities available, while 5% disagree. 47% believe that their education is better enhanced in the laboratory than the classroom, while 19% disagree. 58% believe that there is ample opportunity to present research. 63% were encouraged to pursue research, primarily by freshmen advisors, sophomore advisors, pre-med advisors, and professors, but also by other students.

37% have pursued summer research, through PRISE, Herchel Smith, and RIKEN BSI Summer Program. 63% of respondents look to their concentration adviser for information about research opportunities and funding, while 63% also look to e-mail listservs. 51% of respondents have pursued science opportunities outside Harvard, 58% have found Harvard helpful in obtaining those opportunities, and 81% have considering combining their research with an international experience.

26% of respondents presented research at Harvard, through the PRISE, Harvard Undergraduate Research Symposium, THURG, and HCURA Symposium. 19% of respondents have been published in an undergraduate science journal.

Problems with research

47% of students had trouble establishing and/or maintaining contact with a research professor and 12% of students had issues with working in a laboratory without a clear intellectual goal. 23% of students had problems finding funding.

Academic Experiences

Collaboration and competition

84% believe that science classes are more competitive than non-science ones, while 5% disagree. 93% of respondents agree that they collaborate with peers in their concentration, while 63% agree that they do with non-concentration peers. 12% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	91%	70%	0%	9%
Oral Communication	95%	56%	0%	16%
Knowledge of current scientific literature	93%	77%	0%	7%
Knowledge of public policy	81%	37%	5%	30%
Ethics of science	91%	35%	2%	21%
Knowledge of other scientific fields	81%	72%	2%	5%

General Experiences

Satisfaction with concentration and Harvard as a whole

70% of respondents are academically satisfied with Neurobiology as their concentration, while 74% are personally satisfied with it. 84% are academically satisfied with Harvard as a whole, while 7% are not. 70% are personally satisfied with Harvard, and 12% are not.

Concentration resources

49% of respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. 79% feel that Harvard directs enough resources to the concentration.

Qualitative observations

There was a general feeling that ‘pre-professional,’ specifically ‘pre-med,’ students dominate Harvard as a whole and concentrators generally characterize the science culture as competitive. Some characterizations include:

- ‘A little bit competitive, but full of friendly people. A lot of emphasis is placed on research.’
- ‘I think competitive is the key word. It is high-stress....’
- ‘There is a constant perfectionist pressure.’
- ‘Harvard is very science geared; there are a lot of resources devoted to encouraging people to continue with science.’
- ‘Asking about opportunities and trying to break into research without knowing anything about it is extremely intimidating here.’

Asked for suggestions for specific improvements, the responses included:

- ‘There are many Harvard undergraduate science organizations, but they don’t actually do anything.’
- ‘I would also like to hear more from science concentrators who’ve traveled abroad and done research all over the world.’
- ‘They should make classes more equal in terms of difficulty.’
- ‘I wish information regarding research were more consolidated...’

Organismic and Evolutionary Biology

General Comparisons

The interesting feature of responses for this concentration is that the majority come from Freshmen, suggesting large appeal of OEB to at least some proportion of new students (no other concentration showed such trend). OEB students come to Harvard with previous research experience more frequently than students in other concentrations. They are also more likely to think that research opportunities are plentiful (75% vs. 62% across concentrations). OEB students seem more satisfied with Harvard's efforts to familiarize them with current scientific literature (85% vs. 59%).

Demographics

N = 20; 13 female, 7 male; 12 class of 2012, 5 class of 2011, 0 class of 2010, 3 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 55% are pursuing a secondary field, including statistics, chemistry, MBB, government and languages. Only two respondents did not come to the college planning to study science. A strong majority (75%) of respondents are considering going into a career in the life sciences; 55% are also considering medicine, while 20% or less are interested in other sciences, government, law or business.

Research Experiences

Research opportunities

35% of the respondents came to the College having previously done research and 60% of respondents have already done research for no course credit while here. This is interesting finding, considering that most of the responses came from Freshmen. Most of the research experiences were in the Department and the Museum of Comparative Zoology, but two individuals worked at the Medical School and the Radcliffe Institute. All the respondents spend no more than 10 hours per week on this activity.

85% of all respondents believe that research opportunities are important for science education.²⁸ 70% of respondents think that it is easy to find research opportunities at Harvard and 75% agree that there are many research opportunities available. 20% consider finding research opportunities difficult, while 15% complain that there are not enough such opportunities. Only half of the respondents say that practical experiences are more important for their education than class work, but the other 40% are neutral (possibly because of their lack of experience at Harvard).

²⁸ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

Although 60% agreed that there are enough opportunities to present research results, only 20% have actually presented and 10% have published in student science journals. Furthermore, only 30% attended a research-related event at the college (e.g. the Undergraduate Research Symposium). This result may be explained by the fact that 85% of all respondents were Freshmen and Sophomores.

The main sources of information about research and funding have been email lists (45%), concentration advisors (40%), academic and residential advisors (40%), the Student Employment Office (40%) and the CARAT database (30%). 5 out of the 8 respondents who are not freshmen pursued a summer research program during college.

While 60% pursued research opportunities extramurally and 70% are interested in international research experiences, only 50% found Harvard helpful in making such arrangements.

Problems with research

25% of respondents experienced problems with funding, 20% with unexciting work and 15% had problems communicating with mentors.

Academic Experiences

Collaboration and competition

80% believe that science classes are more competitive than non-science ones, while only 10% disagree. More respondents report collaboration with peers in concentration classes (85%) than in non-concentration ones (65%). 15% do not collaborate with peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	100%	55%	0%	20%
Oral Communication	100%	70%	0%	15%
Knowledge of current scientific literature	80%	85%	0%	0%
Knowledge of public policy	75%	45%	5%	30%

Ethics of science	70%	35%	20%	5%
Knowledge of other scientific fields	85%	70%	0%	0%

General Experiences

Satisfaction with concentration and Harvard as a whole

75% of the respondents were both academically and personally satisfied with OEB as a concentration. This result may of course be largely influenced by the skewed distribution of class year. Only one respondent is unsatisfied with OEB. Similarly, Harvard is rated as personally and academically satisfying by 75% and 65%, respectively. 10% find their life at the university personally unsatisfying, while 20% do not enjoy it academically.

Concentration resources

Only 65% of the respondents know a faculty member reasonably well (which may still be a good result, considering the age distribution). 70% feel that Harvard directs enough resources to the concentration.

Qualitative observations

The qualitative comments generally reflect the feeling that Harvard is dominated by “resume-driven” pre-professional students and by pre-meds in the sciences. Encouragingly, many respondents characterized OEB as a more welcoming concentration. The comments below are a selection of the comments on scientific experiences in general and on OEB:

- ‘The science culture here seems to be somewhat resume driven.’
- ‘[Science at Harvard] is somewhat unsatisfying at the introductory levels, but gets better once you take smaller classes. There is high pressure to take a defined set of courses with little flexibility, although this is not true for [OEB].’
- ‘Science is being promoted by magazines such as THURJ and I think that leads to a more comprehensive and inclusive scientific culture and environment that would not have been possible with classes alone.’
- ‘[Harvard science is] walled off and specialized, with little time for collegial discourse. Not as stimulating as I thought it'd be.’
- ‘I think OEB is friendlier and more open than other science departments, and less competitive.’
- ‘Only at Harvard could I (elicit) an awed response of "that's so intense! I could never do that - science is so hard" when replying "OEB" to a query of concentration.’
- ‘OEB always has the oldest buildings. ./’
- ‘OEB is amazing. It just needs to be better recognized. :)’

Most respondents did not have any suggestions for specific improvements. Two suggestions appeared multiple times:

- To give OEB students more opportunities to socialize.
- To improve the introductory courses and the selection of mid-level classes.

Physics

General comparisons

Many experiences of physics concentrators reflect the overall experiences of science concentrators. Of note, 78% of physics concentrators think it is easy to find research opportunities at Harvard and 100% believe that research is important for a science education, while only 60% of science concentrators believe the former and 81% the latter. Physics concentrators are less likely to believe that Harvard provides them with the skills sets mentioned below compared to the average science concentrator. They find ethics of science less important and knowledge of other scientific fields more important than average. Finally, 81% of concentrators have at least one faculty member who they feels cares about them, greater than the average 62%.

Demographics

N = 32; 13 female, 19 male; 11 class of 2012, 9 class of 2011, 8 class of 2010, 4 class of 2009

Concentrations, Secondaries, and Career Interests

Of the respondents, 47% are pursuing a secondary field. The most common secondary fields are astrophysics and economics (3 respondents each), but range from philosophy to linguistics. 88% are considering going in the physical sciences; 63% are considering applied science or engineering.

Research Experiences

Research opportunities

44% of the respondents came to the College having previously done research, mostly through research at a local university. 50% have done research while attending the College, through a variety of Harvard departments. 44% of researchers spend either 1-5 hours per week on research, and 38% spend 6-10 hours. 100% of respondents believe that research opportunities are important for science education.²⁹

78% of respondents think that it is easy to find research opportunities at Harvard. 44% think that their education is better enhanced in the laboratory than the classroom, while 3% disagree. 72% think there are many research opportunities at Harvard. 66% were encouraged to pursue research, primarily by professors, advisers and fellow students. Steve Wofsy, Alexander Schier and John Doyle were specifically mentioned.

²⁹ When percentages do not sum to 100%, the remaining respondents were neutral on the question.

25% have pursued summer research, mostly through REU, PRISE and HCRP. 53% of respondents look to HCRP/SEO for information about research opportunities and funding, and 56% looks to concentration advisers. 69% of respondents have pursued science opportunities outside Harvard, 59% have found Harvard helpful in obtaining those opportunities, and 72% have considering combining their research with an international experience. Only 6% have engaged in research at other Harvard schools.

22% of respondents presented research at Harvard, through HURS, off-campus conferences, PRISE, REU symposium and the Department. 13% attended student science activities (HURS and SPS). None have published in an undergraduate science journal.

Problems with research

38% of students had trouble establishing and/or maintaining contact with a research professor. 25% had issues with working in a laboratory without a clear intellectual goal and problems finding funding, and 16% had trouble finding funding.

Academic Experiences

Collaboration and competition

53% believe that science classes are more competitive than non-science ones, while 19% disagree. 91% of respondents agree that they collaborate with peers in their concentration, while only 31% agree that they do with non-concentration peers. 41% do not collaborate with non-concentration peers.

Skill development

The following table indicates if students (strongly) agreed or (strongly) disagreed that certain skill sets are important for their future, and if they (strongly) agreed or (strongly) disagreed that Harvard prepares them with those skills.

	Important	Harvard does provide skills	Unimportant	Harvard does not provide skills
Scientific Writing	91%	25%	3%	34%
Oral Communication	100%	41%	0%	38%
Knowledge of current scientific literature	78%	16%	6%	38%
Knowledge of public policy	69%	9%	9%	50%
Ethics of science	53%	6%	6%	50%

Knowledge of other scientific fields	84%	38%	6%	16%
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General Experiences

Satisfaction with concentration and Harvard as a whole

75% of respondents are academically satisfied with Physics as their concentration, while 78% are personally satisfied with it. 13% are not academically satisfied and 6% are not personally satisfied. 75% are academically satisfied with Harvard as a whole, while 13% are not. 84% are personally satisfied with Harvard, and 6% are not.

Concentration resources

81% of the respondents have at least one faculty member in the concentration who they know reasonably well and cares about them. 72% feel that Harvard directs enough resources to the concentration.

Qualitative observations

Asked about the type of student that dominates Harvard, most responses were similar to the following three:

- ‘Pre-professional, for the most part. But in physics there's a lot of pre-academic. I think both are supported at Harvard.’
- ‘I think there is a good balance of different the different types of students at Harvard.’
- ‘Most students seem to be government or economics concentrators, often pre-med or bound for law school, but physics majors don't seem to be marginalized.’

Similarly, opinions about the culture of science and math at Harvard could be described by one of the following statements:

- ‘Highly motivated students who are concerned about their futures and not afraid to jump into science feet first. Science courses tend to have a reputation of difficult coursework, and this rep is well deserved.’
- ‘There is a strong culture of science at Harvard, but it is hard to get to know professors at Harvard, especially with the amounts of students in lectures and even sections. Personal connection with professors in science is difficult to acquire.’
- ‘I believe the culture is very supportive of new members learning how to do science. In the research I've been exposed to, the professors' attitudes are very open and helpful to undergraduates. I culture emphasizes personal exploration.’
- ‘The culture of science is limited to a relatively small group on campus but within that group, it is very exciting, interesting, and close-knit.’

- ‘Intense’, ‘collaborative’

Suggested specific improvements for the department:

- More dynamic classes
- Greater ease for study abroad
- Real-world connections to material
- More opportunities for interaction with professors
- More structured curriculum
- More interaction between concentrators
- Better teaching; faculty should focus more on teaching and less on research
- The concentration should seem more approachable
- Emphasis on laboratory work and presentation skills earlier

Appendix B: SABS Survey

SABS - Undergraduate Science Experiences at Harvard College

This poll's results will not be available to respondents online.

Thank you for taking this survey, "Undergraduate Science Experiences at Harvard College." Please proceed to answer the questions below. Any comments or suggestions are appreciated.

Please answer the demographic questions below. Your answers will be kept confidential.

QUESTION 1:

What is your class year?

QUESTION 2:

What is your gender?

QUESTION 3:

Which House are you in? If you are a Freshman, please select that choice.

QUESTION 4:

If you are a science concentrator, what is your concentration? If you have not declared yet, please select the concentration you are most likely to choose.

QUESTION 5:

If you are not a science concentrator or if your concentration is not listed above, what is your concentration?

Text Limit: 250 characters (approximately 5 lines)

QUESTION 6:

Are you pursuing a secondary field?

No

Yes. Please specify which secondary field:

QUESTION 7:

Which of the following best characterizes your choice of concentration? If you are a freshman, please select which road you are going to pursue if you are sure.

I began college thinking I would concentrate in a scientific field, and now I am concentrating in a scientific field

I began college thinking I would concentrate in a scientific field, and now I am concentrating in a non-scientific field

I began college thinking I would concentrate in a non-scientific field, and now I am concentrating in a scientific field

I began college thinking I would concentrate in a non-scientific field, and now I am concentrating in a non-scientific field

Not decided yet. Please discuss which concentration you are considering:

QUESTION 8:

If you changed your mind about your concentration (either the second or third choice above), please discuss why you switched fields.

QUESTION 9:

What field(s) are you considering going into as a career? Please check all that apply.

Applied Science or Engineering

Business

Consulting or Finance

Government

Law

Life Sciences

Medicine or Healthcare

Physical Sciences

Other. Please specify:

The following questions are about research experiences at Harvard.

QUESTION 10:

Are you currently working in a research laboratory or have you worked in a lab during term time?

- No
- Yes. Please tell us where you are working or have worked (e.g. HMS, MIT, MCB Dept.)

QUESTION 11:

If you are working or have worked in a research laboratory while at Harvard, approximately how much time do or did you spend researching each week (during the school year)?

- 1 - 5 hours
- 6 - 10 hours
- 11 - 15 hours
- 16 - 20 hours
- 21 - 25 hours
- Other. Please specify:

QUESTION 12:

	A. Strongly Disagree	B. Disagree	C. Neither Agree nor Disagree	D. Agree	E. Strongly Agree
Research opportunities are important to my science education at Harvard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy to find research opportunities at Harvard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are many research opportunities available to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My understanding of science is better enhanced in the research laboratory than in the classroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

There is ample opportunity
for me to present my
research (e.g. symposia,
publications, etc)



QUESTION 13:

Have you presented your research while at Harvard?

- No
- Yes. Please tell us in what venue you presented your research (e.g. symposium, publication, off-campus conference, etc)

QUESTION 14:

Have you attended or presented at Harvard student organization research symposia (e.g. Harvard Undergraduate Research Symposium, Boston Undergraduate Research Symposium, Harvard Stem Cell Society Symposium, etc) or attended faculty talks put on by these student organizations?

- No
- Yes. Please list which symposia and what year(s) you participated and/or which organization's faculty events you attended.

QUESTION 15:

Have you published with any Harvard science-related student organizations (e.g. Harvard Brain, Harvard Science Review, The Harvard Undergraduate Research Journal, etc)?

- No
- Yes. Please tell us which publication(s) you have contributed to:

QUESTION 16:

Has anyone encouraged you to pursue research at Harvard? If yes, please describe who (e.g. professor, TF, fellow student, freshman advisor, etc) and what year you were in when you were encouraged (e.g. freshman, sophomore, junior, or senior).

- No
- Yes. Please identify who encouraged you and when you were encouraged.

QUESTION 17:

Have you experienced any of the following?

	Yes	No
Difficulty establishing or maintaining communication with a research professor	<input type="radio"/>	<input type="radio"/>
Work in the lab that does not seem to serve an intellectual goal	<input type="radio"/>	<input type="radio"/>
Problems finding funding or materials for lab research	<input type="radio"/>	<input type="radio"/>

QUESTION 18:

Where do you look for or who do you ask about research opportunities or funding?
Please check all that apply.

- Harvard College Research Program (HCRP)/Student Employment Office (SEO)
- E-mail Listservs (e.g. OCS)
- CARAT
- Concentration advisers
- Proctors, Tutors or Freshman/Sophomore advisers
- Peer Advising Fellows (PAFs)
- Harvard College Undergraduate Research Association
- Other. Please specify:

QUESTION 19:

Have you participated in a summer research program during college?

- No
- Yes. Please specify which program (e.g. PRISE, REUs, off-campus program, etc):

QUESTION 20:

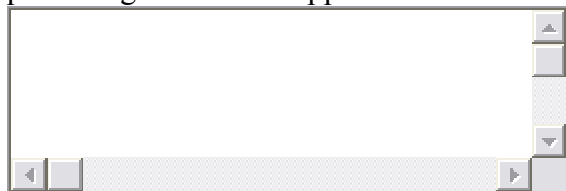
Did you do lab research before entering college?

- No
- Yes. Please tell us in what context (e.g. science fair, university partnership program, summer program)

QUESTION 21:

Please use this space to elaborate on any of your answers to the above questions

pertaining to research opportunities.



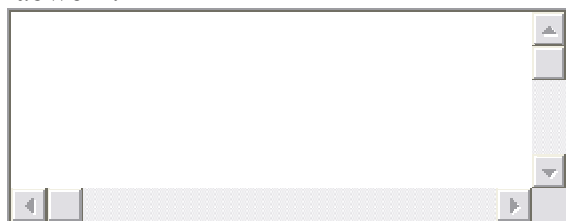
The following questions are about coursework.

QUESTION 22:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I find science courses to be more competitive than non-science courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I collaborate with my peers in my concentration courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I collaborate with my peers in my non-concentration courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

QUESTION 23:

Please discuss how collaborations with your peers have shaped your experience at Harvard. These collaborations include, but are not limited to, study groups and labwork.



Text Limit: 250 characters (approximately 5 lines)

QUESTION 24:

Approximately how much time do you spend on your non-concentration classes each week (including lectures, course labs, sections, and outside work)?

- 1-5 hours
- 6-10 hours

- 11-15 hours
- 16-20 hours
- 21-25 hours
- Other

QUESTION 25:

Approximately how much time do you spend on your concentration classes each week (including lectures, course labs, sections, and outside work)?

- 1-5 hours
- 6-10 hours
- 11-15 hours
- 16-20 hours
- 21-25 hours
- Other

QUESTION 26:

I feel that the following knowledge or skills are important for my future:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Scientific Writing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oral Communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge of Current Scientific Literature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge of Public Policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ethics of Science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge of other Scientific Fields	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

QUESTION 27:

I feel that Harvard prepares me with the following knowledge or skills:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Scientific Writing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oral Communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Knowledge of Current Scientific Literature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge of Public Policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ethics of Science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge of other Scientific Fields	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

QUESTION 28:

If applicable, please discuss how you have acquired the above knowledge or skills (e.g. research, coursework, etc).

Text Limit: 250 characters (approximately 5 lines)

The following questions relate to your concentration and general experiences at Harvard.

QUESTION 29:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
From an academic perspective, I am satisfied with Harvard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From a personal perspective, I am satisfied with Harvard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From an academic perspective, I am satisfied with my concentration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From a personal perspective, I am satisfied with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

concentration

QUESTION 30:

Is there at least one faculty member in your concentration that you know reasonably well and that you feel cares about you?

- No
- Yes. Please elaborate on how you became acquainted (e.g. adviser, research/class professor, etc)

QUESTION 31:

What is the culture of science at Harvard? How would you characterize or define it?

Text Limit: 250 characters (approximately 5 lines)

QUESTION 32:

What type of student (e.g. pre-academic, pre-professional, etc) do you feel dominates at Harvard? Is Harvard better suited for a particular type of student?

Text Limit: 250 characters (approximately 5 lines)

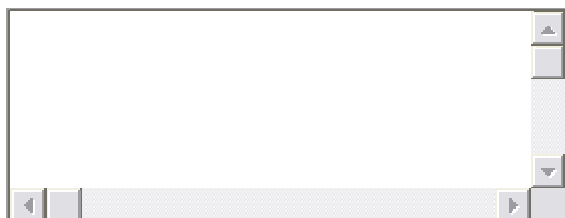
QUESTION 33:

Do you feel that Harvard dedicates enough resources to your concentration?

- Yes
- No. Please elaborate:

QUESTION 34:

What is something specific that you think can be improved about your concentration?



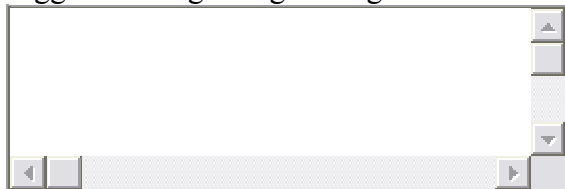
Text Limit: 250 characters (approximately 5 lines)

QUESTION 35:

	Yes	No
Have you engaged in science research at other Harvard schools (medical, dental, business, etc)?	<input type="radio"/>	<input type="radio"/>
Have you sought scientific research opportunities outside of Harvard?	<input type="radio"/>	<input type="radio"/>
Is Harvard helpful in arranging scientific research opportunities beyond its walls?	<input type="radio"/>	<input type="radio"/>
Have you considered combining science research with an international experience?	<input type="radio"/>	<input type="radio"/>

QUESTION 36:

Please use the space below if you have any additional comments, questions, or suggestions regarding undergraduate science at Harvard.



Thank you for completing the survey.

Upon the completion of this poll, the user will be directed to the following URL:
<http://harvardsabs.weebly.com>
