RECRUITMENT AND RETENTION OF FACULTY IN COMPUTER SCIENCE AND ENGINEERING

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CONTENTS

EXECUTIVE SUMMARY

This report addresses the recruitment and retention of faculty in computer science and engineering (CSE) in the United States. The study was initiated to address concerns about the effect that departures of faculty to industry (e.g., dot-com companies) might have on the ability of universities to carry out their research and teaching missions. There was particular concern about the possibility of another "seed-corn" crisis—that the flight from the universities would mean not only an inadequate number of faculty to train this generation of information technology professionals, but also that the teaching ranks themselves would not be replenished, thereby affecting our ability to educate future generations of information technology workers.

During 2001 and 2002, the period in which the proposal was written and the study was conducted, many events had an effect on the recruitment and retention of CSE faculty—not the least being the dot-com crash and an economic recession. Clearly the edge has been taken off the industrial pull of faculty for now. This is not to say, however, that the issue has been resolved. There remains a legacy of unfilled faculty positions. There is also every indication of an increasing need for computer science and engineering faculty over the long term.

The report identifies significant problems in the faculty recruitment process. Most significantly, about one-third of open faculty slots remain unfilled. At the same time, competition is intense for the pool of top candidates. It is especially difficult to hire women and underrepresented minorities. The report also reveals that the recruitment process is becoming very burdensome. The recruitment season is increasing in length, more candidates are being interviewed, and more effort is being made to encourage the acceptance of job offers. Many departments are "maxed out" in the sense of interviewing candidates almost every day during recruiting season. The cost in time and money is significant.

The study found that the major reasons for accepting faculty job offers include the presence of colleagues in one's area of research, the ranking/reputation of the department, geography, and the quality of graduate students (in that order). Reasons for rejecting offers include geography, "two-body" problems, the ranking/reputation of the department, and the lack of colleagues in one's research area.

Contrary to the common perception, the study also found that faculty retention was not a significant issue in terms of raw numbers. Departments lost an average of less

than 10 percent of their faculty per year. However, 53 percent of these went to another academic institution, 32 percent to industry, and the rest to "other institutions." The loss rate to other academic departments has increased during the past two years. The study also found that 18 percent of new hires came from industry. Consequently, the net loss to industry is not large. It is hypothesized that the perception that faculty retention is a problem comes from a combination of factors—more faculty are on leave (sabbaticals and other leaves), open slots are not being filled, projected open slots are not being filled, the number of faculty leaving for other academic departments is increasing, and hiring top candidates is difficult. Additionally, even though the raw numbers of faculty who leave are low, some may be key members of the department.

Survey results indicated that departments lose faculty for many reasons, including retirement, death, personal reasons, change to part-time status, and departures for other jobs in industry or academia. Chairs of doctoral departments reported that the factors that most influenced faculty to leave were, in descending order, the appeal of industry, personal reasons, salary, and departmental ranking/reputation. Undergraduate chairs reported a higher percentage of faculty losses due to death, retirement, and personal reasons than did the doctoral chairs; they also reported fewer losses due to salary and teaching load. Academics who had recently changed jobs gave highest priority to the following reasons: access to quality graduate students; departmental morale/culture; departmental ranking/reputation; and salary.

The study makes several key recommendations. These include ways to improve recruiting by addressing: 1) personal issues (e.g., those dealing with salary and "two-body" problems); 2) environmental factors (e.g., suggesting that department strategic plans be developed to articulate a vision and how the candidate fits into this vision); 3) the recruiting process (e.g., dealing with the interview process); and 4) ways to increase the pool of top candidates.

Recommendations for retaining faculty are divided into how to prevent faculty losses and how to react to potential faculty losses. A set of preventative measures is enumerated. Counteroffers are highly recommended as a reactive measure, in spite of the potential difficulties that these may cause within a department.

Several general recommendations are also provided: 1) carefully track the faculty retention issue; 2) investigate techniques to reduce the overhead of faculty recruiting; and 3) develop approaches to increase the pool of CSE Ph.D.s.

Lastly, the report also recommends that a long-term process of data collection be instituted so that recruitment and retention issues can be tracked over many years.

1. INTRODUCTION

This report from the Computing Research Association (CRA) addresses the recruitment and retention of faculty in computer science and engineering (CSE) in the United States. The study was initiated because of CRA's concern about the effect that faculty departing for industry (e.g., dot-com companies) might have on the ability of universities to carry out their research and teaching missions. There was particular concern about the possibility of another "seed-corn" crisis—that the flight from the universities would mean not only an inadequate number of faculty to train this generation of information technology professionals, but also that the teaching ranks themselves would not be replenished, thereby affecting our ability to educate future generations of information technology workers.

During 2001 and 2002, the period in which the proposal was written and the study carried out, many events had an effect on the recruitment and retention of CSE faculty—not the least being the dot-com crash and an economic recession. For now, the edge has been taken off the pull of faculty to industry. This is not to say, however, that the issue has been resolved. There remains a legacy of unfilled faculty positions. There is also every indication of an increasing need for CSE faculty over the long term. No exogenous event, whether economic or terrorist-related, has curtailed the impacts of Moore's Law and networking technologies on the creation of information technology jobs. The continued growth of jobs in this sector creates a long-term need to ensure that we can recruit and retain adequate numbers of qualified faculty in the future to teach computer science and engineering in our colleges and universities.

The study had three overall goals: 1) to assess the reality of faculty recruitment and retention problems in CSE (i.e., to separate fact from fiction); 2) to propose long-term tracking of recruitment and retention by identifying which data to collect; and 3) to make specific recommendations for improving the recruitment and retention processes.

2. STUDY METHODOLOGY

With the study goals in mind, CRA formed a study group to evaluate problems in the recruitment and retention of CSE faculty and to identify potential solutions. The group selected represents a wide range of backgrounds and interests. Several are members of the CRA board of directors. It also includes faculty from small and large universities, top-ranked and lesser-ranked research institutions, schools from urban and rural settings from across the country, and schools both near to and distant from concentrated centers of high-tech industry. The study focuses mostly on research universities; however, since the four-year colleges also play a role in both education and research in the information technology field, we included an expert on the subject to represent faculty at undergraduate institutions. Industrial research laboratories are one of the common career destinations for graduate students and faculty in computing, and so we also included people who have worked in and managed industrial research laboratories.

While CRA controlled these appointments and the study group included CRA board members, the board did not control the content of the report. The study group itself is solely responsible for the report's views, findings, and recommendations.

The study group met three times for two-day meetings between December 2001 and June 2002 to refine the basic issues, identify data that needed to be collected, analyze the data collected from other sources and from our own surveys, and shape findings and recommendations. Between January and June 2002, Patrick McMullen of the CRA staff conducted five surveys (see Appendices A through E) and prepared an initial analysis of the data collected. Several subgroups (led by Clayton Lewis, Eric Roberts, Jack Stankovic, and Stuart Zweben) drafted sections of the report. Preliminary results were presented at the CRA conference for department chairs, lab managers, and IT deans at Snowbird, Utah, in July 2002. A number of people then reviewed and commented on the draft. The final version was prepared by Jack Stankovic and Bill Aspray, with staff assistance from Jean Smith at CRA.

During their three meetings, the study group identified a number of widely held perceptions about the recruitment and retention of CSE faculty. Some of the data collected were intended to confirm, disprove, or otherwise shed light on these perceptions. The study group also identified a number of other issues that they thought deserved attention, including, for example:

- the impact of non-sabbatical leaves on the ability of departments to cover their teaching load;
- whether certain common recruitment strategies limit the ability of departments to fill their open positions;
- gender differences in the job application process;
- the frequency and severity of "two-body problems"; and
- the effectiveness of various kinds of interventions by administrators when faced with the possible loss of a faculty member.

Data on these issues were collected as well. In general, the study group wanted to identify specific issues in advance and shape survey questions that would uncover information about them, and avoid the random collection of masses of data in the hope that some knowledge could be mined from them.

Overall, the process was iterative. After some discussion of key issues, the group first conducted a survey of some chairs of computer science departments that grant a Ph.D. Based on these results, we then conducted four additional surveys of:

1. department chairs of computer science departments at undergraduate institutions;
2. recent Ph.D.s in CSE;
3. job changers who recently held faculty positions in CSE; and
4. faculty-hiring committees in doctoral-granting CSE departments.

The sample sizes of these five surveys are small for several reasons. It was difficult to identify job changers. Our staffing, financial resources, and time were all limited. And we were reluctant to burden department chairs with yet another survey, so we selected only a minority to sample. Indeed, the first survey asked if the chair would be willing to respond to follow-up questions, and not a single chair wanted to take the time to do this.

The questions and responses from all five surveys appear in Appendices A through E. Information about the targeted group and the sample size is also provided for each survey.

We compared our survey results with those of the annual surveys conducted by both CRA (Taulbee Survey) and the National Center for Education Statistics, and the level of consistency among these data sets was heartening. One concern we had was the timing of our study, which might have taken a snapshot at just the wrong time (at the height of the dot-com bubble or at a low point after the dot-com crash). However, our data, which cover the years 1999-2002, span both of these events, and thus are less likely to be indicative of a single point in this process.

References are made throughout the report to Tier 1, Tier 2, and Tier 3 departments. These refer to the rankings assigned by the National Research Council's study *Research-Doctorate Programs in the United States: Continuity and Change* (study conducted in 1993, released in 1995). Tier 1 refers to departments ranked 1 to 36; Tier 2 to those ranked 37 to 72; and Tier 3 to those ranked 73 to 108.

This study is the first to attempt to analyze the many different aspects of the recruitment and retention process from multiple perspectives. Although the sample sizes are small, we believe that the results suggest important issues that future studies might explore more fully.

The report includes a set of recommendations. They are informed, but not determined, by the data that we have collected. Many of the recommendations are based as well on the knowledge and experience of the study group members as they have worked through these problems themselves. For example, the data show that salary adjustments are only somewhat successful in retaining faculty, so the recommendations focus on other measures. In another case, the data show that "two-body" problems influence recruiting success, so the recommendations call for departments to address this issue. Future empirical study could test the effectiveness of these recommendations. One important aspect of the recommendations is to identify data that should be collected on an ongoing basis.

We believe that this study, although not definitive, is a good first step toward understanding a set of issues that will be with the computing research community for many years to come.

3. FACULTY RETENTION

There are two prevalent perceptions about the retention of CSE faculty. One is that the loss rate of faculty to industry is high. The other is that many faculty are being lost to other academic institutions.

Before addressing these specific perceptions, it is helpful to consider the overall rate of faculty losses. The CRA Taulbee data show that, excluding leaves of absence, there were 1.95 losses per department in AY00-01, and that this rate was up from 1.36 losses in AY98-99. The average size of a doctoral department is about 20 to 25 tenured or tenure-track faculty, with more than 30 faculty on average in the top-ranked institutions and fewer than 20 faculty in the lower-ranked departments. Thus the total loss rate, excluding leaves of absence, averages less than 10% per year per department. (It should be pointed out that the vacancy rate could be much higher than the loss rate if unfilled positions were carried over from a previous year. Indeed, there are many such examples.)

Chairs of doctoral departments surveyed (Appendix A) reported that for faculty who left their university:

- 53% went to another academic institution
- 32% went to industry
- 12% went to "other"
- 2% went to a non-profit organization
- 0% went to government

How do we put these numbers in perspective? Is a loss rate of less than 10% high, low, or about average? Several comparisons are suggestive:

- The high-tech industry has indicated that it regards a vacancy rate of 5% as full employment because there are always some positions in the process of being filled, and having open positions provides opportunities to hire quickly when desirable candidates become available ("evergreen positions").

- The American physics community reports that its turnover rate had increased to 7.3% for tenured and tenure-track faculty in 1999—not much different from the rate for computer science. [*APS News Online*, April 2001, http://www.aps.org/apsnews/0401/040104.html]

- Annual turnover rates for the entire faculty of a university (across all disciplines) ranged from 2% to more than 10% in the mid-1990s in a survey of 13 colleges and universities. [Margaret N. Harrigan, "An Analysis of Faculty Turnover at the University of Wisconsin-Madison," presented at the 39th Annual AIR Forum, May 30-June 2, 1999, Seattle, WA. http://wiscinfo.doit.wisc.edu/obpa/FacultyTurnover/FacultyTurnover2.html]

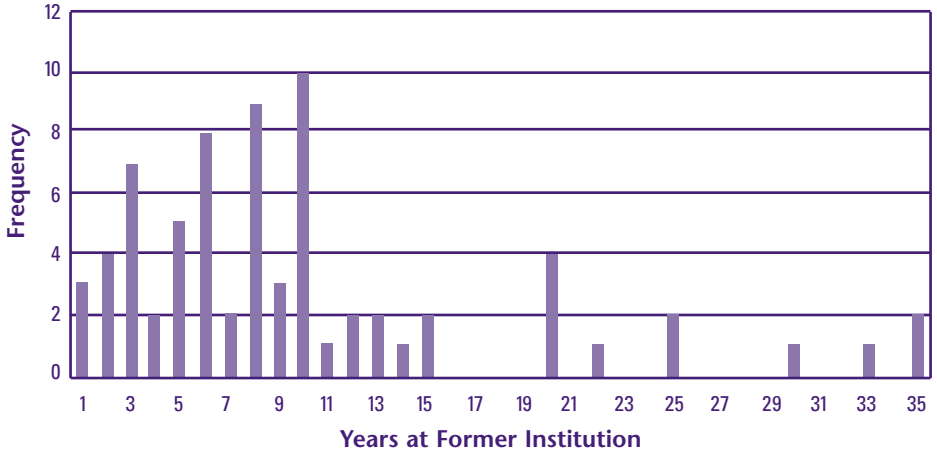
- In the State of Texas, faculty turnover rates for AY99-00 averaged 6% for public universities and Lamar two-year institutions. The turnover rate for universities with more than 500 tenured or tenure-track faculty was 5%, whereas for all other institutions it was 7%. The disciplines losing the greatest number of faculty (in descending order on number of faculty lost) were liberal/fine arts, health professions, education, and science/mathematics. About 29% of the losses at research universities were of faculty moving to other academic institutions ("Faculty Turnover and Retention: A Summary of Faculty Exit Surveys at Texas Public Universities, Health-Related Institutions, and Technical Colleges, Fiscal Year 2000," Texas Higher Education Coordinating Board, March 2001).

- Turnover rates in some low-level service positions, such as workers at fast-food restaurants, range up to 400% per year.

These comparisons suggest that the overall faculty loss rate for CSE is not something to be alarmed about.

The doctoral chairs' survey reveals some striking patterns regarding at what point in their careers faculty members leave for other jobs (Figure 1). The results and some speculations about the reasons are as follows:

Figure 1. Faculty Losses by Years of Service



Source: CRA Survey of Ph.D. Department Chairs 2002.

- The largest number of faculty left after 10 years of service in their previous institution. These may be people who have passed tenure and promotion to the associate level and, having established themselves, are ready to move on to higher-ranked schools or places that are better suited to their research interests. Their careers may be in full stride and they may be close to being promoted to full professor. These faculty are often actively recruited by other institutions and may be viewed as emerging stars in their area.

- The second-largest number of faculty left their previous institution after eight years—presumably soon after having received tenure and being promoted to associate professor, and likely for many of the same reasons that the 10-year cohort chose to depart. These are faculty who have proven themselves with strong research records. They may have waited until after the tenure decision as a safety precaution that would make it easier to demand tenure elsewhere.

- A number of people left after six years, presumably because of a tenure offer from another school that was more suitable for them or because of concerns about their chances for tenure at their current institution. Another frequent departure time was after three years. This may be because the faculty member decided another environment was more suitable or because of an unfavorable report from the department after completing the initial three-year term as assistant professor. Faculty also may have found their environment less desirable than they thought it would be.

PERCEPTION: ***Faculty are being lost to industry.***

FINDINGS:

It is easy to understand why there would be a widespread perception of a significant loss of CSE faculty to industry. The dot-com boom of the mid-to-late 1990s created many opportunities for faculty to engage in industry employment involving interesting research and entrepreneurship. Media reports heightened the awareness that a migration from academia to industry was taking place. *The Chronicle of Higher Education*, for example, ran a story entitled "Computer Scientists Flee Academe for Industry's Greener Pastures" (September 24, 1999). Similar articles appeared in other high-profile publications, including *The New York Times* (Ethan Bronner, "Voracious Computers are Siphoning Talent from Academia," June 25, 1998). Word-of-mouth reports of prominent people leaving academia further fueled the belief that something significant was happening nationwide. Department chairs also were complaining about the increased number of departures and faculty taking non-sabbatical leaves.

To investigate the accuracy of this perception, we used the following data sources:

1. *The CRA Taulbee Survey.* This survey collects information annually about faculty departures, including the number that leave for industry positions.

2. *Our surveys of doctoral and undergraduate chairs.* Both included questions that shed some light on this issue. For example:

   - Does the recruiting picture look any different now than it did prior to the dot-com bust?
   - Did the recruiting picture change following the September 11, 2001, terrorist attacks?
   - How many faculty left for industry positions during the past three years, and what kinds of companies did they join?
   - What were the ranks of the faculty who left (i.e., assistant, associate, or full professor)?
   - What factors (including "the appeal of industry") did chairs believe had the most influence on a faculty member's decision to leave?
   - For chairs who answered "the appeal of industry," what specific factors did they believe made industry positions appealing to their faculty?
   - How many faculty were hired from industry during the past year?
   - How have retention issues changed during the past decade?
   - What are your leave-of-absence policies (such as their duration) for unpaid (i.e., non-sabbatical) leaves, and how many faculty currently are taking such leaves?

3. *Our survey of job changers.* We hoped that this survey would also provide relevant data, but since only four of the respondents applied to industry, the sample is too small to obtain any useful data about migration to industry.

Although many of the questions in the doctoral chairs' survey were more about recruitment than retention, it is possible to get some sense of both absolute and net loss of faculty to industry positions. The survey from doctoral-granting departments showed that 18% of new hires during the past year came from industry. It also showed that 29% of losses during the past three years were to industry, with a higher percentage loss from tiers 1 and 2 than from tier 3 departments. Undergraduate department chairs reported that industry hires comprised 17% of their total hires (similar to that of Ph.D.-granting departments), and the departures to industry were 21% (somewhat less than that of doctoral-granting departments).

Looking at these percentages, one gets the impression that there was a net loss of faculty to industry. However, when one observes that there were more hires than losses during this period (that is, that departments were gaining in size), the picture

is reversed. For the doctoral-granting departments surveyed, total losses during the past year were 1.3 faculty per department. Considering the fraction going to industry, this departure rate suggests that approximately 0.4 faculty members per department were lost to industry annually. The average number of tenure-track faculty hired in these departments during the past year was about 2.7, which suggests—given the statistics concerning the source of new faculty—that about 0.5 per department were hired from industry. Thus, this suggests there may have been a *net gain* of about 0.1 persons per department from industry during the past year.

It is also interesting to note that faculty departures are by no means uniformly spread over industrial opportunities. Of faculty who moved to industry, two-thirds went to IT start-ups and one-third joined established companies with research laboratories (Lucent, IBM Watson Labs, Microsoft, Sun). None went to other industrial firms.

For undergraduate colleges, the total losses were about 1.1 per department over three years, indicating that slightly more than 0.2 faculty per department (a little more than 3% of the total tenure-track size of 6.4 per department) are being lost to industry over a three-year period. This is less than 1% per year. As with doctoral-granting institutions, the data suggest that more faculty were hired from industry during the past year than departed to industry.

It is not possible to disaggregate the results of the chairs' survey in order to get year-by-year trends on departures to industry; the survey only provides numbers for the past year and the (aggregated) past three years. It is possible, however, to examine year-by-year trends from the Taulbee data. These data show that, while the absolute number of departures from doctoral-granting departments to industry increased somewhat during the past few years, the number of departments reporting also increased during this period, so that the number of departures per department was consistently in the 0.35 to 0.40 range—and these numbers did not change appreciably from year to year.

The Taulbee Survey typically includes data from 80% to 90% of the doctoral-granting departments each year (for AY 2000-01, 173 of 215 departments surveyed participated). The doctoral chairs' survey we conducted had a much smaller sample (21 of 30 departments surveyed responded). How well did their numbers agree? In the case of average annual departmental loss to industry, the results have strong agreement. In the case of total faculty losses, the agreement is somewhat less: the chairs' survey shows 1.3 per department for the past year and an average of 1.03 per year per department as a three-year average (suggesting that the loss rate was slightly higher in AY00-01 than in the two previous years). The Taulbee Survey reported a somewhat higher total loss rate of 1.64 per department per year. In reexamining the raw data

from the Taulbee Survey, we noted that schools ranked 1 to 24 had a faculty loss rate of about 5 percent, whereas lower-ranked schools had a loss rate of 10 percent.

The appeal of industry was stated by 47% of chairs as one of the main reasons why they lost faculty during the past three years. Salary and the presence of colleagues in the same research area were the most frequent industry attractions, according to department chairs.

To gain a better overall picture of faculty losses to industry, non-sabbatical leaves as well as departures should be considered because faculty often take such leaves to pursue their entrepreneurial aspirations or join a start-up. The chairs' survey provides information about these leaves. On average, two persons per department were on non-sabbatical leave during the past year. Departments typically cap the length of non-sabbatical leaves at either one or two years (about equally divided between these lengths). A few schools have a three-year maximum and a small number of schools have no official limit. The average length of leave is a little over a year, but the average longest leave is 2.3 years. This number is so high because 23% of the departments reported breaking their policy and allowing a leave longer than their stated maximum to at least one faculty member. Several chairs report that retention is a more serious problem now than in past years, but only once was industry mentioned as a main cause. Many chairs reported that retention is no more serious now than it used to be.

The departure rate of faculty to industry appears to be relatively small, and, by itself, the rate does not suggest a significant retention problem. This rate does not seem to have increased on a per department basis during the past few years. Some departments may, however, have a problem with a large number of entrepreneurial leaves. The more highly ranked departments, for instance, are more apt to have a large number of people on leave. These leaves are not necessarily bad for the department or for the field, although they do reduce the number of faculty who are engaged in the department on campus. For a few departments, however, the combination of those on entrepreneurial leave and those who have recently departed (whether to industry or elsewhere) may present a significant retention problem.

The study group also received anecdotal evidence that some people do not re-integrate well into the departments after they return from an entrepreneurial leave. These included people who exhibited less commitment to teaching and service, less willingness to tolerate the academic processes of decision-making and change, and bad attitudes about having to resort to an academic career because certain entrepreneurial opportunities were no longer available.

Problems involving faculty migration to industry, therefore, appear relatively isolated. There does not seem to be a high correlation in our data between faculty

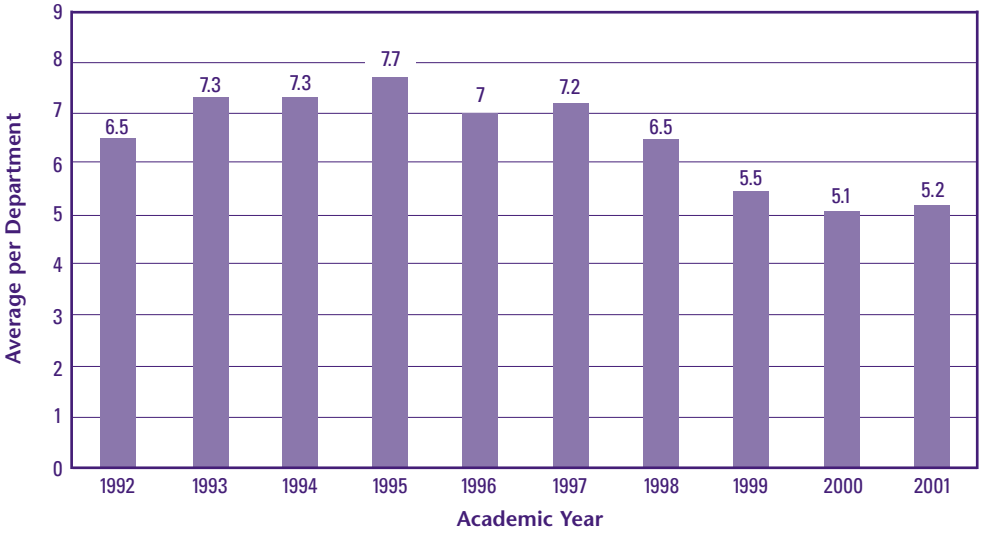
departures to industry and the dot-com boom. Obviously some faculty did leave their universities to join start-ups, and the dot-com crash may have reduced one threat of faculty loss. However, our chairs' survey indicates that the total number of faculty departures in this past year—that is, during the year of the dot-com bust—was slightly higher than during the previous two years, during the height of the dot-com boom. And this increased number does not include those people (about two per department) on non-sabbatical leave. The Taulbee data also show a slight rise this past year in the number of departures per department for non-academic positions. One possible explanation is that these data reflect a residual of previous entrepreneurial leaves (i.e., several persons who are shown as having left the department this year to work for industry could be resignations that were a byproduct of entrepreneurial leaves in the previous two years. The survey instrument does not have the depth of questioning to fully explain the data).

Thus, in conclusion, it appears that there is not a serious problem of faculty flight to industry—and that one did not exist even at the height of the dot-com phenomenon. In fact, there appears to have been a recent net flow of people from industry to academia in CSE, not the other way around. Certainly this statement is true for the most recent year for doctoral departments and for all three years for undergraduate departments. It may be true for the first two years of doctoral departments, but we do not have sufficient data to be certain.

PERCEPTION: ***Faculty are being lost to other academic institutions.***

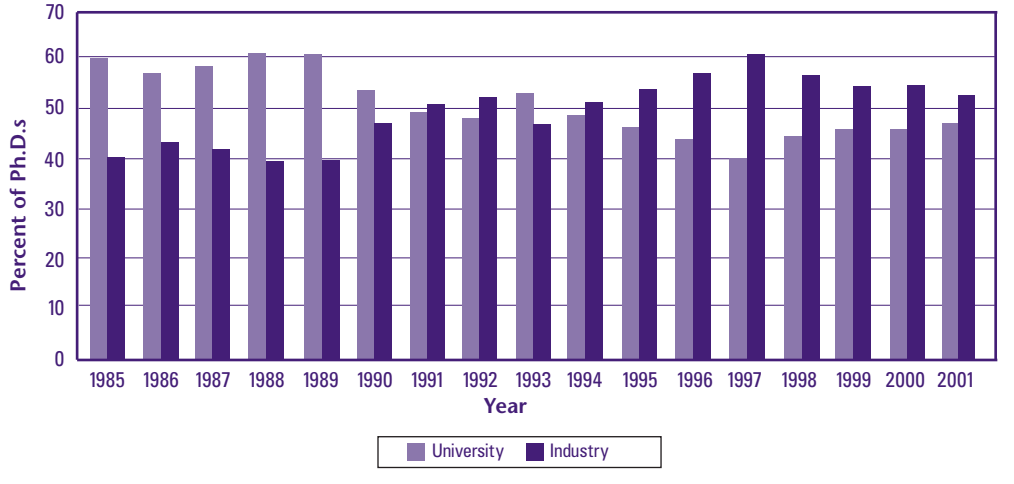
FINDINGS:
Like the discussion of faculty losses to industry, it is also easy to understand why many computer scientists might believe that faculty are being lost in significant numbers to other research-oriented academic departments. Vacant positions appear to be more plentiful in recent years than in the past. At the same time, there have been fewer new Ph.D.s on the market (Figure 2), and a greater fraction of Ph.D.s have chosen industry positions during the past decade (Figure 3).

Figure 2. Average Number of Doctorates Produced Per Department 1992-2001



Source: CRA Taulbee Surveys.

Figure 3. Academic Employment vs. Industry Employment for New CS/CE Ph.D.s 1985-2001



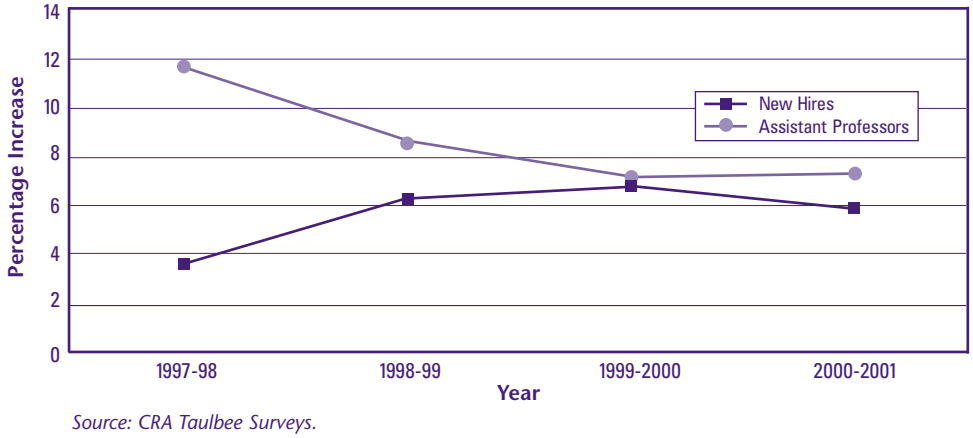
Source: CRA Taulbee Surveys.

While some vacant academic positions have been filled by hiring people from industry and universities overseas, anecdotal evidence abounds that there has been considerable movement of faculty from institution to institution. This phenomenon is known colloquially as *churn* (although from the perspective of department chairs it

might also be considered raiding). Some university administrations have responded quickly to provide new faculty slots. Overall, about one-third of the slots remain open because of difficulties in recruiting. These open positions can contribute to a situation where the faculty and chair are overwhelmed by the current workload without the extra faculty needed to do the job.

At other universities, some faculty and department chairs claim that their institutions are not reacting to the growth in computer science enrollment by increasing the resources for their department. There are also many complaints about salary compression and inversion caused by the sharp rise in starting salaries for new computer science faculty, as departments compete for the diminishing pool of new Ph.D.s to fill an increasing number of jobs. (Salaries for new Ph.D.s reported in CRA's Taulbee Survey were increasing by 6% to 8% per year over a period of several years, while overall computer science faculty salaries typically were increasing by less than the rate for these new graduates.) Departments have made an effort to keep salaries for current junior faculty from getting too far behind salaries of new hires (figure 4); despite these efforts, however, current junior faculty have been falling further behind, with a cumulative effect of more than 10% over three years.

Figure 4. Salary Increases (Percentage) for New Hires and Assistant Professors 1997-2001



Source: CRA Taulbee Surveys.

We used various data sources to examine faculty losses to other institutions:

1. The surveys we conducted of doctoral and undergraduate chairs provide information on a number of related issues, including:
   - number of faculty who left during the past three years to join other academic institutions;

- institutions they selected;
- factors that most influenced them to leave;
- where they were in their career path;
- why people who considered leaving decided to remain;
- what chairs identified as the main retention issues in their department;
- what they were doing to try to prevent retention from being a problem;
- how chairs addressed retention problems once they surfaced; and
- what help/support chairs received from their university administration in dealing with retention issues.

2. The survey we conducted of recent job changers provides:
   - most important factors that caused them to change jobs;
   - criteria they used to decide where to apply for a new position;
   - criteria that most influenced their choice among competing offers;
   - their former department's response, if any, when they learned that they were considering leaving; and
   - migration patterns in terms of the ranking of the current and former academic employers.

3. The CRA Taulbee Survey results provide the number of people leaving graduate departments for various kinds of employment.

The doctoral chairs' survey results (Appendix A) indicate that departments lost faculty for many reasons, including retirement, death, personal reasons, change to part-time status, and departures for other jobs in industry or academia. Of full-time faculty losses, 53% moved to other academic positions, by far the most common reason given for faculty loss. The average annual faculty loss to another academic department is approximately 0.5 persons, which represents about 2.5% of the total tenure-track faculty.

The Taulbee Survey suggests a recent increase in losses to other academic departments. The most recent Taulbee data show a departure of 0.80 faculty per department to other academic positions, up from 0.48 per department just two years earlier.

The job-changers' survey (Appendix D) suggests that it is relatively easy for faculty to find another faculty position. On average, respondents submitted 5.2 applications each and received 3.1 offers to interview (or 1 interview for every 1.8 applications submitted). The average applicant received 2.1 job offers (or 1 offer for every 2.6 applications submitted).

Department chairs report that the factors that most influenced faculty to leave were the appeal of industry (in 47% of departments), personal reasons (42%), salary

(32%), and departmental ranking/reputation (32%). However, the data indicate that there was no real difference in departure rates by the ranking of the institution the faculty member left, that most faculty churn occurred within the same ranking tier, and that about as many moved to a lower tier as moved to a higher tier. The average time to departure was 10.7 years, but, as noted earlier, the greatest number of departures occurred after years 10, 8, 6, and 3, respectively.

In the survey of doctoral department chairs, offering a salary adjustment was the approach cited most frequently to prevent retention problems, followed by providing better facilities and staff support; trying to attract more and better Ph.D. students; and promoting teamwork, communication, and collegiality within the department. A salary adjustment was also mentioned most often as a way of addressing an individual retention problem once it has surfaced; this often involves making a suitable counteroffer. However, we do not know from the data how often the steps taken to address retention problems have been successful. Some deans have been very supportive of retention efforts, others less so. But it does seem generally true that deans are much more reactive than proactive in addressing faculty retention. Some chairs lamented that their administration has been neglectful of their department for several years running.

Undergraduate department chairs (Appendix B) reported a higher percentage of their faculty losses due to death, retirement, and personal reasons than did the doctoral department chairs. In undergraduate colleges, 37% of the faculty losses were to other schools; and like the doctoral departments, this percentage was higher than for those who left for industrial positions. The loss rate to other academic institutions was about 0.13 faculty per year, representing about 2% of total faculty. Salary and teaching load were each mentioned as reasons in about one-sixth of the faculty losses—a lower number than for the graduate departments. In undergraduate colleges, the retention issues cited most frequently by chairs are salary (51%), teaching load (32%), general workload (30%), and geographical considerations (26%). Departmental ranking is not a factor for the undergraduate colleges.

The job-changers' survey results showed striking gender differences in the reasons cited for changing academic jobs. Men cited access to quality graduate students, department morale/culture, departmental ranking/reputation, and salary as the main reasons why they left their former institution. Women cited access to quality graduate students, department morale/culture, and the presence of colleagues in the same research area most frequently. Among males, 43% selected "salary" as a reason for leaving, compared with only 13% of women. While 43% of men selected "departmental ranking/reputation," only 25% of women did so.

These two gender differences are also mirrored in the survey of new hires (Appendix C). In deciding where to apply for faculty positions, men overwhelmingly cited departmental ranking/reputation as a key criterion in deciding where to apply, followed by access to quality graduate students. No other factor was cited by more than 35% of the men. Women cited departmental ranking/reputation, access to quality graduate students, presence of colleagues in their research area, and geography (each of these factors cited by at least half of the women) as the main factors in deciding where to apply. Here the gender differences are most striking, in that men valued salary (28% to 0%) and departmental ranking (76% to 50%) more highly than women.

An interesting gender pattern also was evident in the number of applications submitted. In the new hires' survey, women submitted far fewer applications than men (6 per person for women, 25 per person for men). But in the job-changers' survey, women submitted slightly more applications on average than men (5.6 to 5.1), suggesting that women had "learned the game" of faculty hiring after being in academia for a few years. Interestingly, almost half (47%) of all job changers—both men and women—applied for only one or two faculty positions.

Gender differences were far less evident in responses to the job-changers' survey with respect to the deciding factors when choosing among multiple offers of employment. Both men and women cited departmental ranking/reputation first, followed by geography and access to quality graduate students, and then salary and presence of colleagues in their research area.

According to job changers, the offer of a salary increase was the only systematic response that departments made to counter an impending departure. The main reason cited for the inadequacy of departmental responses was the inability to change the department's culture, morale, or reputation, relative to their new institution. Better institutional support was cited most often by job changers as a factor that might have made a difference in keeping them at their former institution.

In conclusion, while losses to other academic institutions were higher than those to industry, the numbers do not seem to be very high per department. However, the losses per department definitely have increased during the past several years. The total retention problem may be more serious for some departments when the number of faculty losses to industry is combined with the number of faculty on leave. For higher-ranked departments, which tend to have larger numbers of faculty, the absolute attrition numbers tend to be higher and this is what is being noticed. For lower-ranked departments, even though the total attrition percentages are comparable, the people who are leaving or on leave may represent a more significant fraction of the best people in the department. Here the effect on the department's efforts to become stronger is more serious.

4. FACULTY RECRUITMENT

A common perception about CSE faculty recruitment is that academic institutions cannot hire enough qualified faculty. Four intertwined assumptions are involved:

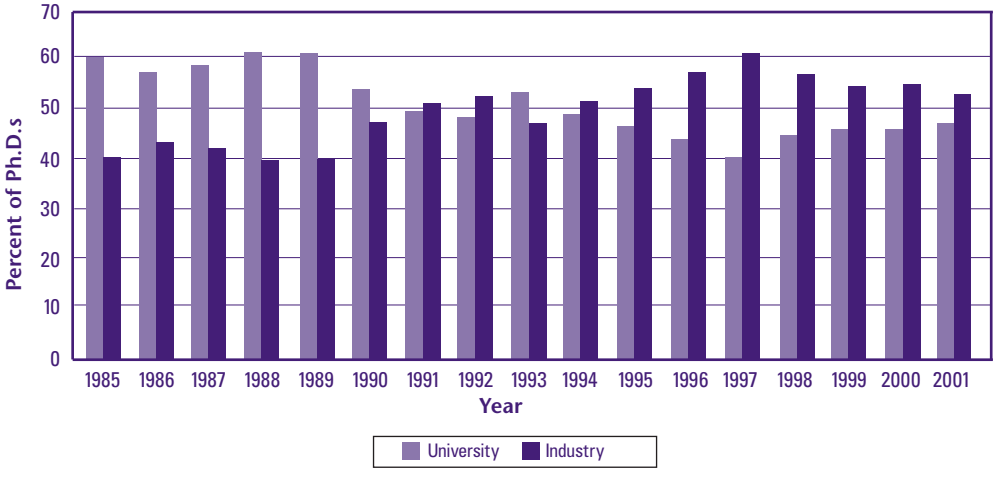
1. Universities are not producing enough Ph.D.s.
2. Most Ph.D.s take positions in industry.
3. There is intense competition for the pool of top candidates.
4. It is especially difficult to hire women and underrepresented minorities.

Our surveys, along with data from the larger CRA Taulbee Survey, confirm the first and third of these assumptions, and lend qualified support to the other two.

As seen earlier in Figure 2, the average Ph.D. production per department has fallen from a high of 7.7 in 1995 to a low of 5.1 in 2000. With the end of the dot-com boom, however, there are signs that future Ph.D. production might once again increase substantially. The 2000-01 Taulbee Survey showed a 31% increase in the number of people entering Ph.D. programs in computer science, an 11% increase in the number passing their qualifying exams, and a 16% increase in those passing their thesis proposal exams. This increase in doctoral candidates may improve the balance between faculty supply and demand over the coming years. Of course, relying on economic downturns to spur graduate enrollments is not a sustainable strategy. Thus it seems unlikely that the problem of low Ph.D. production will be self-correcting.

The second common assumption—that most Ph.D.s go to industry instead of academia—has been true during the past decade. The percentage of doctoral recipients accepting employment in industry has increased since the late 1980s from about 40%, reaching a peak of about 60% in 1997, and receding to a little more than 50% during the past year (Figure 5). At the beginning of the same period, the percentage of doctoral recipients going to academia was nearly 60%, dropped to around 40% in 1997, and has been increasing since that time. The gap between industry and academia was about 20% in favor of academia in the late 1980s, flip-flopped to around 20% in favor of industry by 1997, and has closed since 1997 to about 6% in favor of industry during the most recent year. Thus, during the height of the dot-com boom there was a clear trend in favor of industry and a marked difference from the situation during the preceding decade. However, with the burst of the dot-com bubble, the signs are pointing toward another possible change.

Figure 5. Academic Employment vs. Industry Employment for New CS/CE Ph.D.s 1985-2001

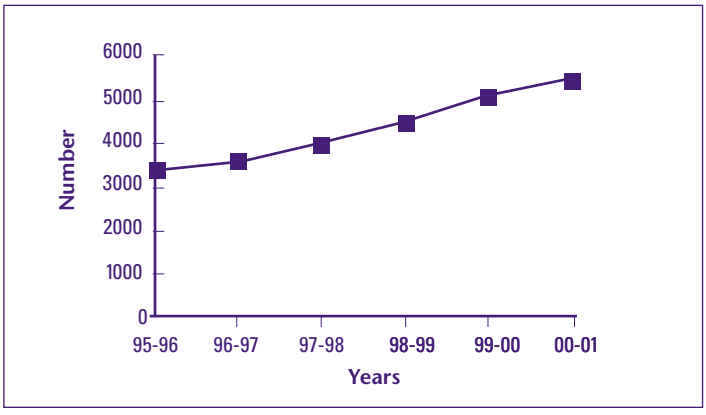


Source: CRA Taulbee Surveys.

The third assumption, that competition for the top candidates is intense, is supported by some circumstantial evidence in our surveys. The new hires' survey shows that candidates from the top tier of graduate institutions (NRC rank 1-36) interviewed at 8.0 departments and received 4.3 offers, tier 2 graduates received 3.6 interviews and 1.9 offers, and tier 3 graduates received 4.4 interviews and 3.0 offers. Clearly there is some overlapping demand for the best applicants.

Although the difficulty of recruiting quality faculty is in part a supply problem, with too few Ph.D.s being produced and too few going to academic institutions, there is an equally pressing problem of demand. The number of academic positions has grown faster than the number of new Ph.D.s taking academic positions. In the annual Taulbee Survey, total faculty sizes reported (including tenure-track faculty, lecturers, and research faculty) have increased steadily over the past 5 years, with three of those years showing a double-digit percentage increase from the previous year (Figure 6). However, after accounting for the difference from year to year in the number of departments providing data, the increases, particularly in the earlier period during the height of the dot-com boom, are more modest (Figure 7).

Figure 6. Total Faculty Sizes Reported 1995-2001



Source: CRA Taulbee Surveys.

Increasing undergraduate enrollments and faculty departures have created many new and open positions that have outnumbered the new Ph.D.s who might fill them. According to the Taulbee Survey, estimated open slots, either from the creation of new positions or faculty losses, outnumbered new Ph.D.s going to academia by a total of 325 during the two-year period 1997-99. That number more than doubled to 735 in the subsequent two-year period (Figure 7). Although we do not have longitudinal data showing how many of those open positions were eventually filled, our surveys do reveal that doctoral institutions filled 66% of their open positions in the last academic year, while undergraduate colleges filled 64%. Recent economic changes would predict that there will be better balance in the new Ph.D. supply and demand in the near future.

Figure 7. Change in Positions Open

Year	Total faculty reported	No. of depts. reporting	Adjusted total for 00-01 depts.[1]	Difference from prev. year	Total departures reported	Adjusted departures for 00-01 depts.[2]	Estimated total openings	Reported Ph.D.s going to academic depts.	Difference
96-97	3491	135	4251		177	227		237	
97-98	3947	144	4527	276	205	246	522	274	248
98-99	4344	157	4664	137	211	233	370	293	77
99-00	4939	166	5079	415	275	287	702	273	429
00-01	5344	173	5344	265	335	335	600	294	306

Source: CRA Taulbee Surveys.
[1]Estimate of 20 faculty per departments not reporting in earlier years.
[2]Based on the same rate of departures per department for departments not reporting in earlier years.

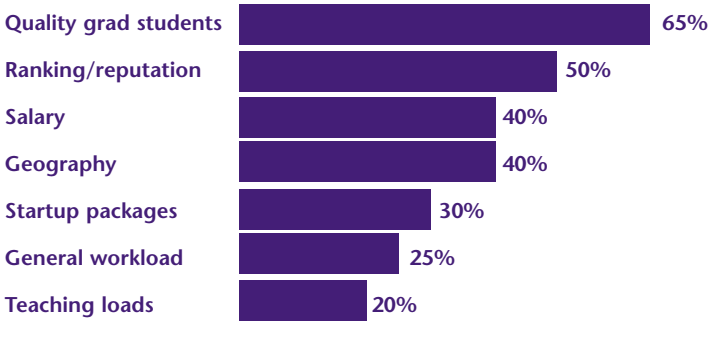
In a perfect system, every open position would be filled by a qualified and appropriate candidate. If one-third of open positions remain unfilled, then obviously a problem exists. To this extent, the common perception that recruiting is difficult, and sometimes even futile, is correct. The source of this difficulty is less obvious, however, and the reasons seem to go beyond supply and demand. Thus we surveyed fresh Ph.D.s, faculty moving from one institution to another, faculty search committees, and department chairs in an effort to find out how the recruitment process works, or in some case does not work, and why it succeeds or fails.

Our survey of chairs of Ph.D.-granting CSE departments was a first attempt to isolate the answers to these questions. The results showed an average of four open positions per institution, with little variation between top-tier and lower-ranked institutions. Tier 1 departments did receive more applications per open position (36) than did tier 3 schools (21), indicating that more candidates are vying for jobs at the highest-ranked institutions. Of the many applications departments received, chairs indicated that only 25% were "seriously considered," meaning that three-quarters were quickly deemed unacceptable and set aside. This lends some support to anecdotal reports that departments receive many untargeted, inappropriate, and uncompetitive applications (although some might say that departments set their standards too high).

These department chairs reported that 22% of their new hires are women, less than 1% are underrepresented minorities, and 36% were not U.S. citizens at the time of hiring. While 75% of chairs said that hiring women and minorities was a priority for their departments, 56% reported having difficulty finding and hiring such candidates.

Chairs identified a number of problems generally in their recruitment efforts (Figure 8).

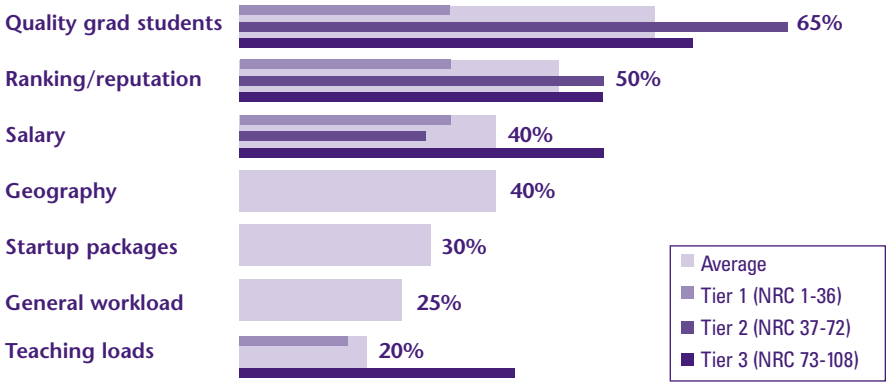
Figure 8. Recruitment Problems Reported by Ph.D. Department Chairs



Source: CRA Survey of Ph.D. Department Chairs 2002.

Recruiting problems seemed to vary by departmental rankings. Lower-tier institutions reported more problems due to their inability to attract quality graduate students, salaries offered, and their ranking/reputation (Figure 9). Top-tier institutions reported many of the same problems, but to a much lesser extent.

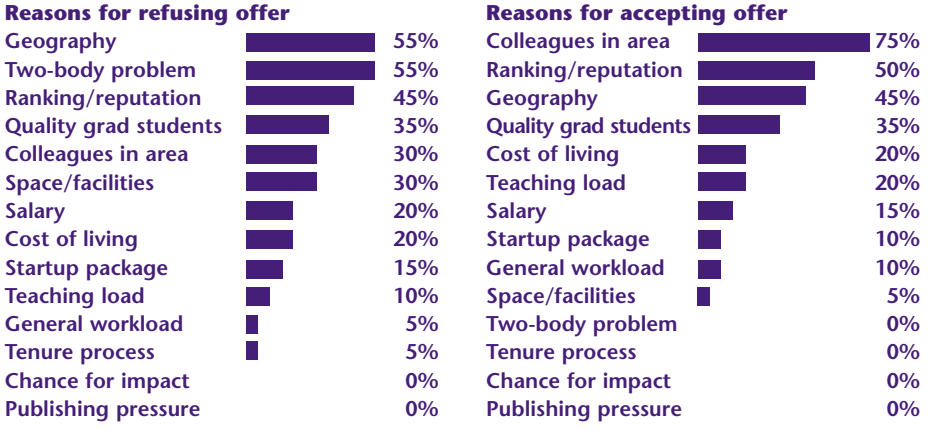
Figure 9. Recruiting Problems Reported (by Departmental Rankings)



Source: CRA Survey of Ph.D. Department Chairs 2002.

We also asked department chairs why they thought most candidates had either accepted or declined their employment offers. Figure 10 shows the results, with geography, "two-body" problems, departmental rankings, and access to quality graduate students leading the list of reasons why offers were declined. Offers were accepted because of the presence of colleagues in the same research area, departmental rankings, geography, and graduate students. The one notable difference between these lists is the percentage citing "two-body" issues as a motivating factor: 55% of those who lost a candidate said that "two-body" problems were partly to blame, while no respondents offered the resolution of this issue as a reason they were able to hire faculty. This may be because employment for a spouse or partner is seen as a "gateway issue," in that resolving this problem is not a reason for someone to accept an offer, but it does make it possible to consider the offer on its merits.

Figure 10. Ph.D. Chairs' Reasons Why Candidates Refused/Accepted Offers



Source: CRA Survey of Ph.D. Department Chairs 2002.

Our survey (Appendix C) of new faculty hires (those hired at the associate or assistant level in the past three years) honed in on a candidate's criteria for deciding which positions to apply for and which offers to accept. It is important to note that our sample may have been unrepresentative of the candidate pool as a whole. The people surveyed were highly motivated young faculty who were driven to succeed, and perhaps their experiences and qualifications do not match those of the average applicant. On the other hand, respondents were fairly well distributed among the ranks of graduate institutions, with 59% coming from tier 1 institutions and 41% from tiers 2 or 3. Even if the sample is somewhat skewed toward the most qualified candidates, their perceptions would seem important to any department seeking to hire the best and the brightest.

The new hires we surveyed reported a very favorable climate for job seekers. The average applicant applied for 22 positions, had 6 interviews, and received 3.5 offers. These patterns vary somewhat by the ranking of the student's graduate institution.

- Tier 1 (NRC rank 1-36) graduates had 8.0 interviews and 4.3 offers.
- Tier 2 (NRC 37-72) graduates had 3.6 interviews and 1.9 offers.
- Tier 3 (NRC 73-108) graduates had 4.4 interviews and 3 offers.

New hires reported using fairly similar criteria when deciding where to apply and which offers to accept (Figure 11). Ranking/reputation and geography were among the top factors, with the department's morale/culture cited as a recruiting draw by 38% of respondents.

Figure 11. New Hires' Reasons for Applying/Accepting Job Offer

Source: CRA Survey of Ph.D. Department Chairs 2002.

Despite the emphasis on rankings and graduate students, many new hires accepted faculty positions at institutions ranked lower than their graduate institution, indicating some "trickle-down" of Ph.D.s from higher- to lower-ranked departments. In comparing the NRC rankings of the departments that hired the respondents with the rankings of the departments that granted their degree, the average tier 1 graduate moved down almost a full tier, while tier 2 graduates remained in roughly the same tier and tier 3 graduates moved up half a tier. Although only 21% of respondents received their Ph.D.s from tier 3 institutions, 41% were hired by those institutions.

Our survey of faculty search committees (Appendix E) requested some of the same information as the new hires' survey, but the results showed a less positive atmosphere for job seekers. The new hires' survey included only applicants who had actually obtained a job, which may explain why the search committees reported a much higher ratio of applications to offers than the new hires reported. According to the search committees:

- Only 23% of open positions went unfilled. (Note that this is different from the responses of the department chairs, who reported that 33% of positions go unfilled.)

- One interview was granted for every 12.7 applications (compared with the 1.0 to 3.5 ratio from the new hires' survey).

- One offer was extended for every 43 applications (compared with the 1 to 6 ratio for new hires).

Many applications were summarily rejected for reasons that are not entirely clear from our survey. It may be that such candidates clearly did not meet even the minimum threshold set by the search committee for the position, or that limitations or inefficiencies in the search process, not the candidate's qualifications, were responsible for most of the early cuts. The most common characteristics of an obviously unviable application, according to the search committees, include a poor research and publishing record, a poor area match for the department's needs, and a Ph.D. from a lower-ranked institution or a foreign institution of unknown quality.

The search committee survey also mirrored the finding of the chairs' survey that the number of applications varies by institutional rank. Tier 1 schools received 67 applications per open position, tier 2 schools received 54 applications per position, and tier 3 schools received 47 applications per position. According to the new hires' survey, many of these applicants are also applying to, and interviewing with, other institutions. This would explain why 67% of search committees surveyed reported losing their second candidate while waiting for a decision from their first candidate, and 20% said it happens frequently or very frequently. Of the schools surveyed, 52% are able to make more offers than they have positions open, but there is no conclusive evidence that multiple offers substantially improve the chances of hiring a good candidate.

After hearing anecdotal accounts of a recruiting crisis in the undergraduate colleges, we decided to ask chairs of CSE departments at these colleges the same questions we asked chairs of Ph.D. departments. This allowed us to construct a more complete picture of the recruiting environment at the colleges:

- Colleges averaged 0.7 open positions per institution, which, scaled by department size, is roughly half the number open at Ph.D. institutions (2.2 vs. 4.0).

- Colleges received approximately 10 applications per position, compared with 30 reported by Ph.D. department chairs. Even the lowest tier of Ph.D. departments (NRC 73-108) received an average of 21 applications per position.

- Only 40% of applications were "seriously considered," a result that somewhat supports anecdotal claims that colleges receive many untargeted and inappropriate applications.

- 64% of open positions were filled, about the same as the 66% reported by Ph.D. department chairs.

- 32% of new hires are women (compared with 22% in Ph.D. departments).

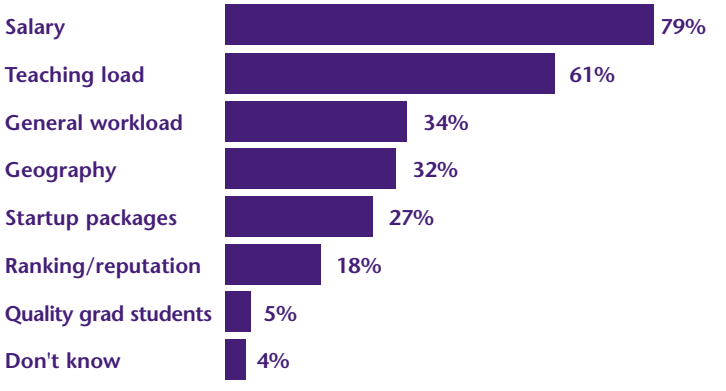
- 41% of new hires were not U.S. citizens at the time of hiring (vs. 36% in Ph.D. departments).

- Like the Ph.D. departments, most new hires at colleges came from academia, with 27% from new Ph.D.s, 51% from other academic institutions, and 17% from industry.

- On balance, colleges gained more faculty from industry than they lost.

CSE departments in undergraduate colleges indicated a number of general recruiting problems, with salary, teaching load, and general workload topping the list (Figure 12). The obstacles to recruiting reported by college chairs were very different from those of their counterparts at Ph.D. schools. Among colleges, 61% cited teaching loads as a recruiting problem, compared with 20% of Ph.D. schools; and only 5% of colleges worried about attracting quality graduate students, while 65% of Ph.D. schools described this as a barrier to recruiting.

Figure 12. Recruiting Problems Reported by Undergraduate Chairs



Source: CRA Survey of Undergraduate Chairs 2002.

When we asked department chairs at undergraduate colleges why candidates had accepted or declined their offer of employment (Figure 13), more differences from the Ph.D. schools appeared:

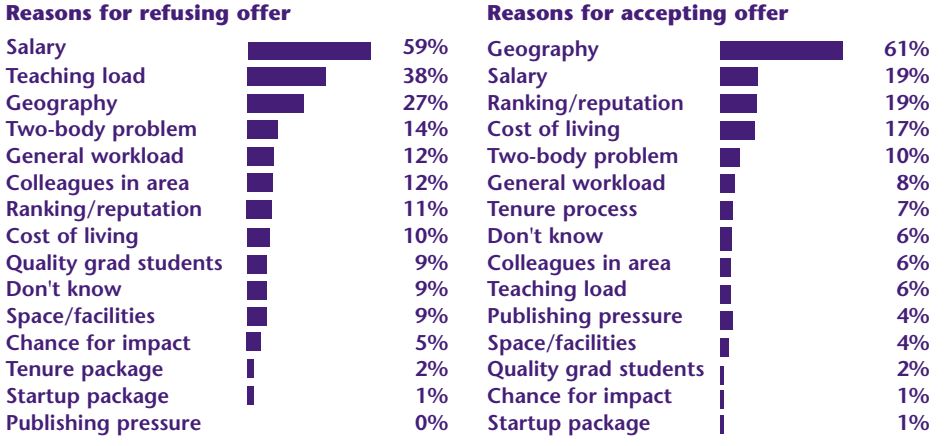
- 59% of colleges lost candidates because of salary, compared with 20% of Ph.D. institutions. This is not surprising, given the low salaries offered by many undergraduate colleges. The average salaries for full, associate, and assistant professors were 71%, 79%, and 73% of salaries for the same ranks at Ph.D. institutions.

- 38% of colleges lost candidates because of teaching loads, compared with just 10% at Ph.D. schools. The average teaching load in the undergraduate departments surveyed was 6.8 classes per year. According to 1999 data from the National Center for Education Statistics, only 30% of faculty at Ph.D.-granting CSE departments taught this many or more courses per year.

- Although 55% of Ph.D. chairs cited the "two-body" problem as a reason for losing candidates, only 14% of the colleges said the same. This may be because 61% of candidates at the colleges are accepting offers based, in large part, on geography, which may be the "two-body" issue with a different label.

- 45% of Ph.D. schools lost candidates because of their ranking/reputation, versus 11% for the colleges. Among Ph.D. schools, 75% cited the presence of colleagues in the same research area as a reason candidates accepted their offers, compared with only 6% of colleges.

Figure 13. Undergraduate Chairs' Reasons Why Candidates Refused/Accepted Offers



Source: CRA Survey of Undergraduate Chairs 2002.

For colleges, the main reason candidates refused their offer was salary and the main reason they accepted was geography. Especially in the case of acceptances, geography dominated the list, indicating that a college's location was far and away the most important factor in recruiting candidates.

FACTORS IN RECRUITMENT OF WOMEN

In the course of our surveys, we found a number of interesting results relevant to the recruitment of women. While the number of women in our samples was generally too small to draw any firm conclusions, the following should spark some interest in further research targeted at the question of gender differences in recruitment and retention:

1. As new Ph.D.s, women submitted far fewer applications than men and received many more offers per application. Female new hires applied for only 6 positions (compared with 25 for men), obtained 0.77 interviews per application (vs. 0.37 for men), and received 0.55 offers per application (vs. 0.19 for men). Obviously women were much more selective in where they applied, and also much more successful in the application process, but the reasons for this selectivity are unclear:

    - Women may have been more efficient in their searches, only applying to the positions that fit them best, or they may have underestimated their value and submitted fewer applications than they should have.
    - The latter theory is partly supported by two additional results from our survey. First, the job-changers' survey shows women applying for slightly more positions than men. This may indicate that women have learned how to game the system more effectively or have gained more confidence in their abilities. Second, if women are underestimating their value, they may be applying to schools with lower hiring standards, which would explain their high ratio of applications to offers.

2. Factors determining which jobs to apply for and which offers to accept were different for female and male new hires:

    - For female respondents, the presence of colleagues in the same research area (44%) and access to quality graduate students (44%) were the most important factors in choosing a job, while these factors were much less important to males. Only 12% of male respondents ranked colleagues in their research area as one of their top four factors in choosing a position, and 20% included graduate students in that list.

- Departmental ranking and reputation were far more important to men; 44% listed rankings as a top factor, while only 22% of women did.

3. For job changers, male and female responses were fairly even in most areas, but men valued salary (28% to 0%) and departmental rankings (76% to 50%) more highly than women.

5. RECOMMENDATIONS

The recommendations presented here are based primarily on the data collected for this study and partly on the experience of the study group members and their discussions during their meetings. Recommendations related to faculty recruitment are organized into four topics: 1) personal issues, 2) environmental factors, 3) the recruiting process, and 4) the candidate pool. Recommendations for improving faculty retention are organized into those that are preventative and those that are reactive. Lastly, several general recommendations are discussed.

FACULTY RECRUITMENT

Personal Issues

1. **Offer competitive salaries.**
   Although salary does not appear to be a primary factor when a candidate is deciding whether to accept an offer, it is an important one. CRA data are published every year that enumerate salaries for new hires and at each faculty rank. Small differences within the competitive range may not preclude an offer being accepted, but a non-competitive salary can be a strong reason to refuse an offer.

2. **Establish mechanisms and offer direct support to address "two-body" problems.**
   Solutions to "two-body" problems seem to be a necessary but not sufficient condition for successful recruiting. It is important to identify such problems early in your contact with a potential candidate and actively pursue solutions. Some universities have formal mechanisms in place to help; this seems desirable since the problem is best addressed at the university, rather than the departmental, level.

3. **Exploit any positive aspects of geographical location.**
   Geography is an important consideration in accepting an offer. Departments should ensure that geographical advantages are made clear to candidates.

4. **Establish competitive teaching loads.**
   It is important to have teaching loads that are comparable to those at other institutions with which you are competing for faculty. Heavy teaching loads or onerous buyout policies place a department at a competitive disadvantage.

5. **Establish a multi-year plan to support new faculty.**
   New faculty may find the following departmental actions supportive in building their careers: a) identifying mentors to assist them, 2) offering multi-year support for equipment and research assistants, and 3) establishing procedures to speed up the process of helping them find graduate students to work with them.

Environmental Factors

1. **Improve the quality of graduate students.**
   New faculty regard access to quality graduate students as a key factor in deciding whether to accept a job at a particular university. Solutions to this problem are difficult because it is a "chicken-and-egg" problem: better faculty draw better students and better students draw better faculty. This suggests a classic bootstrapping approach of improving the quality of graduate students and faculty one step at a time as opportunities arise. Actions can be taken to increase the number of Ph.D. students to the levels needed by the program and the faculty, and to create a good working atmosphere for graduate students and faculty. Faculty should exploit links they have to strong schools, both in the United States and abroad, to attract good graduate students.

2. **Create and expound a departmental vision/strategic plan.**
   Candidates are interested in the future plans of the department. Using a strategic plan, explain how it will strengthen the department and discuss with the candidates how they would fit into the plan. Also discuss specific details about colleagues in the same or complementary research fields. Present a strong plan for the candidate's research area.

3. **Improve the collegial atmosphere of the department.**
   Many techniques can be used to improve departmental collegiality. Involving faculty in the decision-making process and being open regarding how decisions are made form a good basis for collegiality. Overall, decisions need to be fair to avoid favoritism. Proactive approaches to team building—working together to apply for large grants or cooperating on teaching activities, for example—can also help. Positive feedback and encouragement work much better than a "big stick" approach. Various social activities also foster collegiality. Depart-

mental awards and other mechanisms for recognition can be instituted at little cost. Improvements in space or staff support can also improve morale.

Recruiting Process

1. **Convince deans to permit more offers than there are faculty openings.**
   The success rate for faculty hiring is low and the recruiting process is long and difficult. Allowing simultaneous offers to be made to more candidates than there are authorized slots increases the chances of successful recruiting and is unlikely to result in more hires than authorized positions. This mechanism enables a department to act quickly in making an offer, and many times this ability to act will make a positive impression on candidates.

2. **Departments should be realistic in extending invitations for faculty interviews.**
   All departments want to improve. Many departments, at every ranking level, attempt to recruit stars. Departments should make realistic assessments of their chances of recruiting these candidates to avoid wasting precious time on candidates they cannot hope to attract. If an opportunity to invite a "star" arises, it may be wise to invite this person late in the interview season. In this way, a candidate who is truly interested can still interview—or can cancel (and waste nobody's time) if better offers are already in hand. Some schools invite stars so they can influence them with a strong impression of their department, which they hope helps them indirectly.

Candidate Pool

1. **Look for candidates in non-traditional places.**
   Non-traditional places can include industry, overseas, and fields in which people have degrees related to CSE (especially if these people fit into multidisciplinary activities already underway or planned).

2. **Create a plan for attracting and retaining women and minority faculty, and actively implement it.**
   It is important to have a plan for retaining women and minorities, rather than just hoping that you will find qualified candidates in your applicant pool that you can hire. If the department is supportive of its current women and minority faculty and graduate students, it will be easier to attract additional women and minority faculty.

3. **Create a pipeline to other universities.**
   Build on recent hires to help attract new faculty from those same schools. Involve your entire faculty in reaching out to their colleagues at other schools to identify strong candidates.

FACULTY RETENTION

Preventing Faculty Loss

1. **Initiate preventative measures within the department to retain faculty.**
   Once faculty have become dissatisfied enough to interview elsewhere, the department often has few prospects of retaining them. Department culture and collegiality, quality of graduate students, departmental ranking, and salaries are key factors in retaining faculty. Since ranking is a long-term issue, special attention must be given to the other areas over which departments have more direct control. Providing mentoring and reasonable teaching loads are important factors. It is also important to reward faculty who are especially effective (e.g., with tenure or early promotion). Proactive measures and a generally favorable environment will preclude many faculty from ever seriously considering another job.

2. **Teaching institutions must pay competitive computer science salaries.**
   The average salary for a full professor at a teaching institution is almost 30% lower than the average salary for an assistant professor at a research university. Salaries at research universities ranked in the bottom third also significantly trail those at the higher-ranked research universities. Computer science faculty generally are highly marketable, and when the salary gap is wide between what the department pays and what they could receive in industry or elsewhere in academia, this is a strong incentive to consider relocating.

3. **Continue to monitor and solve "two-body" problems.**
   The "two-body" problem can be an ongoing one. While often considered primarily a recruitment problem, it may also contribute to retention problems. Sometimes couples are willing to live apart for the sake of their careers when they are young, but either they tire of the commuting relationship or find it unworkable when they have children. Occasionally, "two-body" problems arise after the couple has joined the faculty, through the relocation of a spouse or the establishment of a new personal relationship with someone at a distance. Continuous monitoring of such situations, and a willingness to apply

both departmental and university-wide resources to address them, can help to retain faculty.

4. **Provide collaborative work environments.**
   Data show that access to colleagues in the same research area is important, especially for women. Efforts must be made to support collaborative work environments and to fairly assess any multidisciplinary work that arises from these collaborations. Departments may choose to concentrate their hiring in a few research areas, rather than maximizing breadth of technical area coverage, in order to improve the chances that faculty members will have colleagues to work with on campus.

5. **Deans must be proactive as well as reactive.**
   Deans are often critical players in helping a department to react to the anticipated departure of an individual faculty member. However, deans must also be cultivated as allies to be proactive in preventing retention problems. They can both help to create a favorable environment in the department and make available financial and university-wide resources as they are needed. Such proactive measures may reduce the number of retention cases that will arise.

Reacting to Potential Faculty Loss

1. **Actions should be taken to retain a valuable faculty member.**
   In many cases, the only action available to try to retain faculty members after they indicate they are considering leaving is to talk to them. Useful topics for discussion include reminders of the advantages your department offers and plans for departmental improvements and how they would affect that faculty member, in addition to any issues the individual raises. Counteroffers may also increase the probability that the person will stay; such offers demonstrate to the individual and to the rest of the faculty that top people are appreciated. This may be tricky, of course, since a counteroffer can sometimes create jealousy among other faculty members.

GENERAL RECOMMENDATIONS

1. **The computer science community should carefully track the problem of faculty retention.**
   It is likely that the faculty retention problem will continue to rise and fall over the years. For example, the recent dot-com phenomenon (both its rise and

crash) had an impact on retention. Similar cycles may occur in the future. Some systemic issues may also affect faculty retention. For example, there is anecdotal evidence that faculty dissatisfaction with their teaching loads and administrative overhead is increasing. These factors do not seem to have affected retention to date, but they bear watching.

2. **The computer science community should investigate techniques, or possibly non-binding agreements, that can reduce the overhead of recruiting.**
Recruiting is time-consuming and expensive, to the point that it is straining the department's ability to carry out its research and teaching missions. The search process now extends over much of the academic year; still, timing issues mean that search processes do not get completed and open positions do not get filled, even when viable candidates are still available. Implementing changes in the recruiting process is partly in the hands of individual departments, but it also depends on the overall action of other schools that are hiring, and on the candidates themselves. Non-binding agreements among universities regarding the length of the recruiting season and limiting the number of interviews could be useful. However, such cooperative arrangements may be impractical, especially if schools that do not abide by the agreement gain an unfair advantage. Novel ways of reducing problems in the recruiting process should be explored further, perhaps by organizations such as the Computing Research Association.

3. **Increase the pool of Ph.D.s applying for faculty positions.**
Because of Moore's Law and the continued growth of the Internet, the increasing demand for IT workers and, hence, for CSE faculty, is likely to be sustained. Departments should try to increase the number of graduate students to meet the needs of their research and teaching functions. Efforts might include talking to undergraduate majors about graduate school and giving them research experience, widening the net of schools from which new graduate students are recruited, and possibly accepting more students with undergraduate majors other than computer science if they show promise that they could succeed in a computer science graduate program. Graduate students should be educated on the positive aspects of a career in academia. Working conditions for faculty should be improved so that more Ph.D.s will consider academia as an attractive career choice. For example, many fields and universities offer a pre-tenure sabbatical, whereas computer science departments typically do not.

6. ADDITIONAL WORK NEEDED

Faculty recruitment and retention issues in computer science are of great interest to many people. We have seen actual trends and perceptions change dramatically from year to year. It is important to collect reliable data every year.

One recommendation is to add several queries to the CRA Taulbee Survey that specifically relate to recruitment and retention. Surveys tend to increase in size over time and can be burdensome to complete. Hence, we need to request only critical data to answer the most important questions.

We recommend that the following relevant questions be added to the Taulbee Survey:

- How many faculty left the department this past year for industry __, for non-sabbatical leaves __, for retirements __ for other reasons __?
- How many faculty returned from non-sabbatical leaves?
- How many faculty applications did you receive?
- How many faculty candidates did you interview?
- How many offers were made?
- How many offers were accepted?

APPENDIX A. SURVEY OF CHAIRS OF DOCTORAL PROGRAMS

SURVEY METHODOLOGY

CRA contacted 30 chairs of doctoral-granting computer science departments and asked them to complete an online survey on faculty recruitment and retention. The 30 departments were drawn from the 108 research-doctorate programs in computer science ranked by the National Research Council in 1995, using an algorithm to distribute invitees evenly among the ranks. Of the 30 chairs contacted, 21 (70%) completed the survey.

ANALYSIS

Faculty Recruitment

- Recruiting faculty is a challenge for most, if not all, of the departments surveyed. In general, departments have been unable to fill all their open positions, with close to one-third of these positions going unfilled. Looking at the retention figures, each department loses one faculty member per year on average, making recruiting even more important. There is also a lack of "serious" applicants, defined as those whose application has a real chance of success at that particular school. Although departments receive many applications, 75% of those are culled immediately.
- The results of this survey do not resolve the question of whether recruiting problems are cyclical or systemic. Several chairs suggested the number of qualified applicants has increased since the dot-com shakeout, with more people moving from industry to academia and more fresh Ph.D.s taking teaching positions. Industry has supplied 18% of the new academic hires in the past year, although that figure seems small compared with the 76% coming from new Ph.D.s or other academic institutions. Indeed, the fact that 38% of new hires come from other colleges and universities suggests that faculty movement is a significant issue in both recruitment and retention.

- From the chairs' perspective, quality graduate students, departmental rankings, geography, salary, the "two-body" issue, and the presence of colleagues in the same area seem to be the main motivating factors in applicants' decisions to accept or decline employment offers.
- Responses were grouped and analyzed along departmental tiers: Tier 1 (NRC rank 1-36), Tier 2 (NRC 37-72), and Tier 3 (NRC 73-108). Although in many cases there was no significant variance in responses by tier, in a few areas potentially important differences appeared. Total applications for open positions, both by department and by position, were higher for Tier 1 schools than Tier 2, and higher for Tier 2 schools than Tier 3. This suggests that more candidates are applying for positions at the higher-ranked schools, leaving fewer, and possibly lower-quality, candidates for lower-ranked schools. Lower-ranked schools did manage to fill open positions at a rate only slightly lower than higher-ranked schools, with Tier 1 schools filling 68% of positions, Tier 2 filling 54%, and Tier 3 filling 62%.
- In reporting the major obstacles their departments face in the recruiting process, chairs of Tier 3 schools were much more concerned about salary and teaching loads than other chairs, and both Tier 2 and Tier 3 schools listed "Getting Quality Graduate Students" and "Rankings" as much greater problems than Tier 1 schools. In the case of graduate students, the difference was dramatic: only 33% of Tier 1 schools listed getting quality graduate students as a major obstacle to faculty recruiting, while 86% of Tier 2 and 71% of Tier 3 schools felt it was a problem.

Faculty Retention

- Here again, there is much more faculty movement between academic institutions than between industry and academia. Although 29% of faculty departures are to industry positions, 53% are to another academic institution. Faculty who do leave tend to have some seniority, with the average departing faculty member having spent 10 years at the former institution. Salary, rankings, and the draw of industry are significant factors in the decision to move on. Personal reasons also play an important role.
- Faculty who considered leaving but ultimately stayed may provide some insight into how departments retain faculty members who are "on the fence." According to the chairs, salary is one of the top motivations to leave in close to 70% of cases; raising salaries is also one of the most-noted solutions to retention problems, suggesting that the simple act of increasing individual salaries can resolve some or many retention problems. It is important to note, however, that in our survey of "recent job changers," faculty who actually left one academic institution for another did not feel that higher salaries alone could retain faculty who had already decided to depart.

- Rankings and the lack of colleagues in the same area of research are other causes of retention problems.

Faculty Leave

- 60% of departments reported having at least one person on leave. Of those, the highest percentage of faculty on leave was 6.7% (two departments), the lowest percentage was 3%, and the median was 5.3%.

RESULTS

Faculty Recruitment

How many faculty positions did you have open in the 2000-2001 academic year?

Average of 4 open positions per department

By department rank:
Tier 1—3.8 open positions per department (excluding outliers)
Tier 2—3.1; Tier 3—3.4

If your institution does not count applications for each position, how many applications did you receive for all of your open positions?

Average of 134 applications per department. Average of 30 applications per position

By department rank:
Tier 1—228 applications per department, 36 applications per position
Tier 2—98 applications per department, 28 applications per position
Tier 3—75 applications per department, 21 applications per position

If your institution does not count applications for each position, how many of the total applications you received did you seriously or realistically consider?

25% of applications were seriously considered

By department rank:
Tier 1—26% of applications were seriously considered; Tier 2—18%; Tier 3—32%

How many faculty positions did you fill in the 2000-2001 academic year?

66% of open positions were filled

At what rank did you hire faculty for each position? (Full, Associate, Assistant, Non-Tenure Track)

8% hired as Full professors; 19% as Associate professors; 65% as Assistant professors; 11% as non-tenure track.

Of the faculty you hired, how many are male and how many are female?

78% male, 22% female

Of the faculty you hired, how many are underrepresented minorities (URM)? (Defined as those groups that are generally underrepresented in computer science: African Americans, Hispanic Americans, and Native Americans).

< 1% URM

If you hired underrepresented minorities, how many of them are female?

The sample size for this question was too small to be useful.

Was it a priority for your department to hire women and underrepresented minorities?

Yes (75%); No (10%); Not directly answered (15%)

Did you have any difficulty hiring women and ethnic or racial minorities?

Yes (56%); No (38%); Not directly answered (6%)

Of the faculty you hired, how many were not US citizens at the time of hiring?

36% were not US citizens at the time of hiring

Of these non-US citizens, how many joined your department on temporary visas?

27% joined their department on temporary visas.

When do you start the recruiting season in a typical year? When do you end it?

September (5%); October (30%); November (15%); December (15%); January (30%); February (5%). The average recruiting season lasts 6 months.

Has the recruiting season gotten longer, shorter, or stayed roughly the same duration over the last decade?

Shorter (0%); Same (40%); Longer (60%)

During the recruiting season, how many hours does the chair personally spend on recruiting in an average week?

8 hours

During the recruiting season, how many person-hours do your faculty, including yourself, spend on recruiting in an average week?

45 hours

What logistical problems, if any, do you face in the interview process?

General scheduling problems (55%)
Getting faculty to attend candidate talks (50%)
No logistical problems (25%)
Getting the candidates to commit to sufficient time onsite (0%)
Money to bring candidates to campus (0%)

What are the major obstacles you face in the recruiting process today?

Getting quality graduate students (65%)
Rankings/departmental reputation (50%)
Geography (40%)
Salary (40%)
Startup packages (30%)
Teaching loads (20%)
General workload (25%)
Don't know (0%)

By department rank:

Salary: (Tier 1) 33%, (2) 29%, (3) 57%
Teaching loads: (1) 17%, (2) 0%, (3) 43%
Getting quality graduate students: (1) 33%, (2) 86%, (3) 71%
Rankings/departmental reputation: (1) 33%, (2) 57%, (3) 57%
Other choices showed no significant difference over ranks.

Thinking of all those who turned down offers from you, what do you feel were their three main reasons?

Geography (55%)
"Two-body" problem (55%)
Rankings/departmental reputation (45%)
Access to quality graduate students (35%)
Lack of colleagues working in the same research area (30%)
Space/research facilities/equipment (30%)
Salary (20%)
Cost of living (20%)
Startup package (15%)
Teaching load (10%)
General workload (5%)
Tenure process (5%)

Opportunity to make a scientific or product development impact (0%)
Publishing pressure (0%)
Don't know (0%)

For those who accepted your offer, what do you feel were their three main reasons?
Presence of colleagues working in the same research area (75%)
Rankings/departmental reputation (50%)
Geography (45%)
Access to quality graduate students (35%)
Cost of living (20%)
Teaching load (20%)
Salary (15%)
General workload (10%)
Opportunity to make a scientific or product development impact (10%)
Startup package (10%)
Space/research facilities/equipment (5%)
Publishing pressure (0%)
Tenure process (0%)
"Two-body" problem (0%)
Don't know (0%)

Where did each new hire come from?
New Ph.D. (38%)
Academic institution (38%)
Industry (18%)
Non-profit institution (5%)
Government (5%)

Faculty Retention

How many faculty have left your department in the past year?
1.3 faculty left per department

How many faculty have left your department in the past three years?
3.1 faculty left per department

By departmental rank:
Tier 1—3.7 faculty left per department; Tier 2—2.0; Tier 3—4.3

Where did the faculty who left go?
53% went to another academic institution; 32% to industry; 12% to "other";

2% to a non-profit institution; 0% to government.

By department rank:
To Industry: (Rank 1) 31%, (2) 44%, (3) 23%
To Academia: (Rank 1) 50%, (2) 47%, (3) 56%

By destination rank:
(Calculated by comparing the NRC rank/tier of the schools faculty left and the schools they went to)
Average departing faculty member moved down 0.17 ranks
Number going up one tier—5
Number going to same tier—17
Number going down one tier—4
Number going down two tiers—3

What were the ranks of the faculty who left?
Full (36%); Associate (38%); Assistant (26%)

How long were these people members of the faculty before leaving?
Average time at institution was 10.7 years per faculty member.
Modalities: most faculty left at years 3, 6, 8, and 10; 74% left in the first 10 years.

Thinking of all the faculty who left, what were the main reasons for their departure?
Appeal of industry (47%)
Personal reasons (42%)
Salary (32%)
Departmental ranking/reputation (32%)
Opportunity to make a scientific or product development impact (21%)
Tenure/promotion (16%)
Access to quality graduate students (16%)
Lack of colleagues working in the same research area (16%)
Geography (16%)
"Two-body" problem (16%)
Teaching load (5%)
General workload (5%)
Space/research facilities/equipment (5%)
Cost of living (0%)
Publishing pressure (0%)
Don't know (0%)

If you chose "appeal of industry," what specifically attracted the faculty member(s) to work in industry?

Presence of colleagues working in the same research area (33%)
Salary (33%)
Less grant-writing demand (22%)
Less committee work (11%)
Stock options/equity (11%)
Better space/facilities (11%)
Better support staff (11%)
Don't know (11%)
Less publishing demand (0%)
Better access to research materials
(e.g., large databases for data-mining research) (0%)

For those faculty who have *considered* leaving (but did not actually leave), what were the key factors in their decisions?

Salary (57%)
Departmental ranking/reputation (24%)
Geography (24%)
Appeal of industry (24%)
Access to quality graduate students (19%)
Personal reasons (19%)
General workload (14%)
Lack of colleagues working in the same research area (14%)
Space/research facilities/equipment (14%)
Opportunity to make a scientific or product development impact (14%)
"Two-body" problem (10%)
Teaching load (10%)
Tenure/promotion (8%)
Publishing pressure (5%)
Cost of living (0%)
Don't know (0%)

What do you feel are the key faculty retention issues in your department?

Salary (67%)
Departmental ranking/reputation (38%)
Space/research facilities/equipment (38%)
Lack of colleagues working in the same research area (29%)
Teaching load (29%)
General workload (24%)
Geography (19%)
Opportunity to make a scientific or product development impact (10%)

Publishing pressure (5%)
Tenure/promotion (5%)
"Two-body" problem (5%)
Cost of living (5%)
Access to quality graduate students (0%)
Startup package (0%)

When a faculty member presents an offer from another employer, how free are you to make counteroffers in the following areas?

Greater salary: No freedom (20%); Some freedom (75%); Total freedom (5%)
Summer support: No freedom (28%); Some freedom (61%); Total freedom (11%).
Decreased teaching load: No freedom (29%); Some freedom (47%); Total freedom (24%).
Leave of absence: No freedom (10%); Some freedom (75%); Total freedom (15%).

Faculty Leave

How many faculty are currently on non-sabbatical leave?

Average 2 per department.
Adjusted average 0.7 per department (this excludes outliers).
60% of responding chairs reported having at least one person on leave.
The highest percentage of faculty on leave was 6.7% (2 schools), the lowest was 3%, and the median was 5.3%.

By department rank:

Tier 1—Average 1.1 per department (excluding outliers)
Tier 2—Average 0.85; Tier 3—Average 0

What is your policy on how long a faculty member may take unpaid leave?

Leave up to 1 year (43%); up to 2 years (43%); up to 3 years (5%); no official policy (9%).

How long is the average unpaid leave? How long is the longest unpaid leave?

Average leave is 1.1 years; average longest leave is 2.3 years.

PH.D. PRODUCTION

How many Ph.D.s did your department produce last year? over the past three years?

Average 7 Ph.D.s produced per school last year.
Average 21 Ph.D.s produced per school over the past three years.

Where did those Ph.D. recipients go?

Industry (45%); academia (40%); other (13%);
government (1%); non-profit (1%).

RESPONSES TO OPEN-ENDED QUESTIONS

Did you have any difficulty hiring women and ethnic or racial minorities? If so, what were those difficulties?

"Availability of competitive applicants"; "Too many positions open for too few applicants"; "There were some female applicants, but none from racial minorities"; "Few applicants, strong competition"; "Few if any applicants each year"; "There were no minority applicants in the applicant pool"; "Competition with peer institutions and industry, two-body issues, spouse did not like [location]"; "Few applications"; "One offer to female candidate turned down"; "Lack of good candidates"; "Pool is too small, plus we have very high expectations."

Have you seen any overall changes in the recruiting process over the past decade, and especially over the past several years? If so, what are those changes?

"More qualified applicants/more open positions in our department"; "No marked changes other than a trend toward fewer applicants in the late 1990s"; "The only change is that the number of applications we receive has gone down from over 200 to around 50"; "We now have more flexibility"; "Electronic communications more important, greater emphasis on minorities, more competition for top candidates"; "No"; "No"; "A much better pool of excellent candidates"; "Less number of candidates; high expectations from candidates as far as salary and starting packages are concerned, competition with industry and other universities"; "More competition from peer institutions, longer season, higher startup packages"; "More competition for fewer good candidates ==> more work"; "No substantial changes"; "Much more competition for the top candidates; people making decisions for personal over professional reasons"; "Weaker candidate pool, fewer good candidates"; "More candidates on market"; "More intense and competitive."

Have you seen any changes in the recruiting process, either overall or in your department, due to the "dot-com" crash? If so, what are those changes?

"No"; "I believe that we are suddenly seeing better resumes"; "Minor changes in that we now have more industrial applicants"; "Many more applicants; increase in applicants from industry"; "More candidates, especially in the number of senior positions"; "Better applicant pool this year"; "When 'dot-coms' were hot, it was difficult to recruit"; "More qualified candidates seem to be available this year"; "More applications"; "Increase in number of applicants"; "More industry applicants; fewer fresh Ph.D.s considering both university and industry."

Is your department doing anything different in the recruiting process now than you have in previous years?

"No" (7 times). "I am aggressive in telephoning people prior to the interview. We are aggressive in making offers, and our dean is willing to make multiple offers for the same position"; "We are more flexible regarding the area of the candidates"; "Beginning the process earlier. Targeting specific research groups of interest nationally rather than simply relying on ads"; "We have a recruiting committee working year around; developed online recruiting database to facilitate wider faculty participation in the evaluation process"; "Started advertising earlier; started interviews earlier; and make offers earlier"; "Small tweaks but nothing significant"; "More aggressive recruiting"; "Different recruiting methods: web postings, different periodicals, etc."; "Starting earlier, keeping posts open until filled"; "We are doing 'pre-interview' visits in fall."

Would you characterize the "two-body" issue as a problem in recruiting? (This is the issue of finding appropriate jobs for both the applicant and her/his partner). If so, how and to what extent has it affected your recruiting efforts? What accommodations or adjustments has your department made?

"It has had a huge effect; more than half of our unsuccessful recruiting episodes involve spouse jobs"; "We have lost good candidates due to this"; "This has not been a significant problem for us"; "We've solved some 'two-body' problems in the past. We've also been unsuccessful in solving others"; "No"; "To a limited extent. We try to help the spouse find a job in the local area. We have had some success with this but it is difficult"; "Not if both bodies are in CS. We have many positions"; "Local industry has been very cooperative with us in the past with this problem"; "Sometimes; it was not a decisive factor"; "Yes. It has not affected our recruiting process so far. We can accommodate the political aspect of this problem"; "Yes, we have an office to assist partners of faculty candidates"; "No. We look for 'two-body' opportunities. Spouses can often pursue careers in local industry"; "We will help the partner network in the local area to help find them positions. If appropriate,

we will interview the partner as a faculty candidate"; "Yes, this is especially a problem in hiring female candidates. On one occasion (10 years back), we hired a female candidate and her husband—a year later"; "We have a good spouse-hiring program, offering 1/3-1/2 of the support for the spouse. We've made two of these offers the past two years; they are a lot of work to generate and neither couple came"; "YES! Either we do not interview when there are obvious problems, or we lose good candidates through lack of responsiveness by the institution"; "We have had applicants turn down offers due to two-body problems"; "This comes up every year with 1-2 candidates"; "Being in a large city helps, but even so we are proactive in finding jobs for the spouse, including on-campus jobs."

What are you doing proactively to prevent retention problems within your department as a whole?

"Improving research and teaching facilities increase reputation"; "Not applicable. After years of mistreatment, some of which was justified, we have an almost totally reborn department in a new college with a new chair and new dean. The upper administration will expect a payoff in the long run"; "Trying to attract more PhD students"; "Try to keep up with national salary levels"; "Trying to find relief from the issues above, but with little success"; "Working to improve faculty salaries. We have already reduced teaching load for faculty who are actively involved in research. Working to attract better graduate students"; "Negotiating with the dean for more resources (special salary raises, space, graduate student support, staff support)"; "Working to facilitate team activities and to provide adequate resources for teaching and research"; "I consult with the Dean and try to promote most productive faculty as fast as acceptable to the administration. I always insist on off-scale salary"; "Work to keep salaries at competitive levels. Create a feeling of collegiality among faculty and staff. Secure resources for additional technical and clerical staff"; "Salary adjustments, resource enhancements, better communication with faculty"; "Raise salaries, improve ranking, make environment better, build new CSE building"; "Working with our dean's office"; "Provide a great deal of support and investment in their research programs. Provide infrastructure"; "i) giving salary raises, ii) recruiting more faculty (creating a better research environment) iii) attracting more Ph.D. students"; "Trying to get additional salary support from the campus administration; trying to get commitment for new CS building"; "1. Addressing salary inversion, 2. Solving two-body problems, 3. Early tenure for outstanding juniors, 4. Reduction in teaching load 5. Encouragement to do joint research, 6. Interdisciplinary ties with other departments, 7. Mentoring"; "Nothing"; "Listen closely; Last year did extraordinary salary adjustments."

How do you address retention problems, once they appear, for the department as a whole?

"Deal on individual basis"; "We really don't have a serious problem with retention. Most people, once they arrive here, really like it here and stay"; "Try to improve the general atmosphere in the department"; "No one has seriously considered leaving to my knowledge"; "For salaries, need to get cooperation from the Dean. Others are handled internally"; "Nothing special"; "If possible work to address problems or deficiencies in the department if this is the motivation for interest in leaving"; "We were fortunate to avoid any retention problems in the last 4-5 years that would require any substantial efforts"; "I try to address specific problems and then solve for general body"; "Talk to Dean"; "I am working on many fronts to increase salaries and endowments, and reduce teaching load"; "Department faculty collaboration"; "Depends upon the cause of the problem: People often leave a department if they feel it is not progressing/improving and there is a lack of an active research atmosphere. Salary issues can be addressed by a supportive Dean. Students can be a difficult problem"; "No department-wide process"; "1. Retreats and open faculty meetings, 2. Discussions with Deans"; "Salary adjustments."

How do you address retention problems, once they appear, for an individual faculty member? In other words, how do you deal with a faculty member who is considering leaving your department?

"Special salary raises for best"; "We have negotiated reduced teaching loads to permit greater research productivity"; "We have only been faced with one retention problem and there was really nothing we could have done to retain the couple"; "One-on-one talks and deals"; "Counteroffer"; "Salary raises, lighter teaching load"; "I try to find out the key reasons for considering leaving the department and act correspondingly, i.e., try to get an increase in salary, get a special position, etc."; "Meet with faculty member and address all his/her concerns, then facilitate a meeting with the faculty member and administration"; "Talk with faculty member, talk to Dean to match offer"; "Determine factors for leaving and try to provide support in areas they feel they aren't receiving it"; "Again, there might be a variety of causes. We are presently losing two faculty members to two-body problems. In both cases, the spouse wanted to find employment in another city. Occasionally in the past, salary has been an issue, and we match the offer"; "Match the offer from the competition"; "1. Open discussion and mentoring, 2. Addressing problems head on"; "If we want the person, we do salary and touchy-feely."

Have you seen any changes in retention issues over the past decade? If so, what are they?

"No" (6 times); "10 years ago, retention was not such a big deal in our depart-

ment"; "Just happening more often"; "No significant change"; "One of the main retention issues is dot- com boom and rapid success of industry"; "Retention was not a problem until recently"; "Have lost some faculty to dot-com and other industry"; "No new issues. When the computing industry does well some faculty leave for industry while other faculty move (up) to replace them"; "Many faculty members feel that other institutions have a better deal (more, better resources, lower teaching loads, more supportive administration)."

How accommodating or helpful is your dean (i.e., the university officer you report to as department chair) with regard to general recruitment and retention issues? (Please briefly explain with details or examples.)

"Somewhat; dean insists on handling everything through him. Higher administration very rigid"; "The current dean has been strongly supportive"; "Will try to match the salary of the competing institution (but only within reason)"; "Moderately helpful within his own constraints"; "Quite"; "Reasonably attentive. Fortunately we have not had any serious problems in this area"; "Very helpful and willing to scramble for money to talk to people who hesitate"; "The Dean is helpful. He understands "market" issues and has been open to such issues as increasing levels of starting salaries and attractive counteroffer packages"; "The Dean is reasonably cooperative. Ex: 2 years ago a full professor was considering leaving. We worked with the Dean and Vice President to get him a 20% salary increase"; "Very—increase salary, generate endowed chair"; "Helpful in arranging startup packages"; "Somewhat accommodating"; "Our Dean is very helpful. We have made higher salary offers and granted leaves of absence in order to retain faculty"; "Very supportive. Approximately 60%-70% of the cost of these retention packages has been provided by the Dean or the campus"; "The Dean controls salaries and startup money, but is responsive when pushed"; "Sometimes helpful, sometimes not"; "Very. Sees senior people, helps arrange aggressive job offers."

How accommodating or helpful is your dean in proactively addressing retention issues? Does your dean work to create an environment that will avoid retention problems? (Please briefly explain with details or examples.)

"Is willing to find ways and fight for them; frequently innovative ideas blocked"; "He is trying to find ways to address the problems above"; "Very. Yes"; "Just recently the dean has begun to provide more resources (faculty slots and space), but over the past five years, essentially no new resources were given to the department"; "Yes, he is very supportive of creating an attractive environment for faculty productivity"; "Quite helpful. Keeps an eye on compensation"; "The Dean is very concerned about retention and checks with chairs about potential problems"; "Here the Dean is not as helpful or proactive. In particular, the issue of space and staff support has been a source

of dissatisfaction for quite some time (and one of the key reasons why people leave), yet it has not yet received adequate attention"; "Recently, the dean has started responding to our request to be proactive"; "Yes, salary program to avoid salary inversion"; "The dean does work with department heads to provide support for these issues. He relies heavily on the recommendations of the faculty"; "This year, I worked with the Dean to obtain substantial salary raises for several faculty members"; "Yes. This year we have a faculty spouse applying for a position and the Dean is working with the Provost to get us partial salary support for that person"; "Not that I can see"; "Dean not strong in this area."

How accommodating or helpful is your dean in reacting to retention problems, such as a faculty member who is considering leaving? (Please briefly explain with details or examples.)

"The dean and upper administration want research productivity. To retain someone who is productive, they will be very helpful"; "Moderately helpful within his own constraints"; "Hasn't come up yet"; "Greater salaries as a part of counteroffers are easy to negotiate. High salaries for new hires are much harder to negotiate"; "If we had problems with a highly productive faculty member leaving I believe the dean would be very supportive of working out special arrangements"; "The Dean usually acts by increasing salary and/or rank"; "The Dean is able to quickly come up with counteroffers. However, at the time a faculty member is seriously considering leaving and has other offers, these efforts are not always successful"; "Yes, raise salary, get chair"; "Helpful with counteroffers"; "Case dependent."

APPENDIX B. SURVEY OF CHAIRS OF UNDERGRADUATE COLLEGES

SURVEY METHODOLOGY

CRA contacted chairs of computer science departments at 800 four-year undergraduate colleges and asked them to complete an online survey on faculty recruitment and retention. Of the 800 contacted, 104 chairs completed the survey, a 13% response rate.

ANALYSIS

- Undergraduate college computer science departments filled only 64% of open positions in the last academic year and only 40% of applications were "seriously considered" (seen as potentially viable). In an earlier survey, Ph.D.-granting institutions reported filling 66% of their open positions, and seriously considering only 25% of applications received.
- 67.5% of new faculty hires were male, 32.5% female, 2.5% are underrepresented minorities (all of whom were also female), 41% are non-US citizens, and 13% of those hired joined the department on a temporary visa. For Ph.D.-granting institutions, 78% of new hires were male, less than 1% were minorities, 36% were non-US citizens, and 27% of those were on temporary visas.
- When asked for the most significant barriers to faculty recruitment, salary was the top choice, with 79% of respondents listing it as a major obstacle. Teaching load (61%), general workload (34%), and geography were other significant recruiting problems. In contrast, only 40% of Ph.D. institutions ranked salary as a major problem in recruiting, 20% listed teaching load, and 25% cited general workload. For Ph.D. institutions, getting quality graduate students (65%) and departmental ranking/reputation (50%) were much more important. The same factors ranked near the bottom for undergraduate colleges, at 18% and 5%.
- For those candidates who turned down offers from undergraduate colleges, salary (59%) and teaching loads (38%) were once again the major factors, with geography (27%) ranking third. For Ph.D.-granting institutions, salary was

much less important (20%) and teaching loads were near the bottom of the list (10%). For these schools, geography (55%), the "two-body" problem (55%), and departmental rankings (45%) were more significant.

- Where a candidate accepted an offer, geography (61%) was the only factor labeled significant by more than 20% of respondents. When combined with the 27% who said geography was a major reason for a candidate going elsewhere, it seems clear that location is a major factor in the decision-making process for applicants to undergraduate colleges. Geography was also important for the Ph.D.-granting institutions (45% of chairs rated it as significant), but the presence of colleagues in the same research area (75%) and departmental rankings (50%) were seen as more important.
- Faculty retention seems to be much less of a problem for undergraduate colleges than for Ph.D.-granting institutions. The colleges reported losing only 0.4 faculty members per department over the last year and 1.1 per department over the past 3 years. Ph.D. institutions reported losing 1.3 and 3.1 faculty members over the same periods. This may be because undergraduate college faculty, for whom geography is a significant factor in choosing a position, feel more anchored to their location, or possibly because faculty at Ph.D.-granting institutions are more upwardly mobile and have more opportunities to move to industry or other academic institutions. It may also be true that the demands of research compel these faculty to seek out positions at better research institutions.
- We asked the undergraduate colleges how many faculty they had lost to industry over the past three years and how many they had hired from industry over that period. The colleges reported hiring 18% more faculty from industry than they lost to industry.
- The key retention issues for undergraduate colleges mirrored their recruiting issues: salary (51%), teaching loads (32%), general workload (30%), and geography (26%) topped the list. Salary was even more important to the Ph.D.-granting institutions (67%), and teaching loads (29%), general workload (24%), and geography (19%) were in the same range. Departmental ranking (38% to 6%) and space/research facilities (38% to 12%) were much more significant for the Ph.D. institutions. however.
- Salaries for computer science faculty at undergraduate colleges were lower across the board than at Ph.D.-granting institutions. The CRA Taulbee Survey, which collects salary information from Ph.D.-granting institutions, reported the following average salaries in 2001: Full professor $105, 396; Associate professor $81,050; Assistant professor $ 76,651; Non-tenure-track teaching faculty $ 55,450. At the undergraduate colleges, salaries for a Full professor average $75,015, for an Associate $63,892, for Assistants $56,036, and for non-tenure-track faculty $49,250.

RESULTS

Applications and Positions

64% of open positions were filled
10.5 applications were submitted per position
4.2 applications were "seriously considered" per position
40% of applications were "seriously considered"
18% of applications lead to an interview
53% of interviews lead to an offer
62% of offers were accepted

Gender and Ethnicity of Hired Faculty

Of the faculty you hired, how many are male and how many are female?
67.5% of those hired are male; 32.5% of those hired are female.

Of the faculty you hired, how many are underrepresented minorities? (Defined as those groups that are generally underrepresented in computer science: African Americans, Hispanic Americans, and Native Americans).
2.5% of those hired are underrepresented minorities.
2.5% of those hired are underrepresented minority females.

Of the faculty you hired, how many were not U.S. citizens at the time of hiring?
41% of those hired were non-U.S. citizens at the time of hiring.

Of these non-U.S. citizens, how many joined your department on temporary visas?
13% of those hired joined a department on a temporary visa.

Recruiting Problems/Issues

Has the recruiting season gotten longer, shorter, or stayed roughly the same duration over the last decade?
Longer (54%); Same (40%); Shorter (6%).

What are the major obstacles you face in the recruiting process today?
Salary (79%)
Teaching loads (61%)
General workload (34%)
Geography (32%)
Startup packages (27%)
Rankings/departmental reputation (18%)

Getting quality graduate students (5%)
Don't know (4%)

During the recruiting season, how many hours does the chair personally spend on recruiting in an average week?

Response: 3.3 hours.

During the recruiting season, how many person-hours do your faculty, including yourself, spend on recruiting in an average week?

Response: 8 hours.

What logistical problems, if any, do you face in the interview process?

General scheduling problems (37%)
Money to bring candidates to campus (36%)
Getting faculty to attend candidate talks (17%)
Getting the candidates to commit to sufficient time onsite (8%)

Thinking of all those who turned down offers from you, what do you feel were their three main reasons?

Salary (59%)
Teaching load (38%)
Geography (27%)
Two-body problem (14%)
General workload (12%)
Lack of colleagues working in the same research area (12%)
Departmental ranking/reputation (11%)
Cost of living (10%)
Access to quality graduate students (9%)
Don't know (9%)
Space/research facilities/equipment (9%)
Opportunity to make a scientific or product development impact (5%)
Tenure process (2%)
Startup package (1%)
Publishing pressure (0%)

For those who accepted your offer, what do you feel were their three main reasons?

Geography (61%)
Salary (19%)
Departmental ranking/reputation (19%)
Cost of living (17%)
Two-body problem (10%)
General workload (8%)

Tenure process (7%)
Don't know (6%)
Presence of colleagues working in the same research area (6%)
Teaching load (5%)
Publishing pressure (4%)
Space/research facilities/equipment (4%)
Access to quality graduate students (2%)
Opportunity to make a scientific or product development impact (1%)
Startup package (1%)

New and Former Faculty

Where did each new hire come from?

Academia 51%; New PhD 27%; Industry 17%; Other 4%; Government 1%.

How many faculty have left your department in the last year?

38 faculty (0.4/department)

How many faculty have left your department in the last three years?

87 faculty (1.1/department)

Over the last three years, where did the faculty who left go?

Left due to retirement, death, or other reasons (39%)
Left for another academic position (37%)
Left for industry (not research lab) (14%)
Left for industrial research lab (7%)
Left for non-profit (7%)
Left for government (0%)

Thinking of all the faculty who left, what were the main reasons for their departure?

Other (33%)
Personal reasons (17%)
Salary (16%)
Teaching load (14%)
Geography (10%)
Appeal of industry (8%)
General workload (8%)
Tenure/promotion (8%)
Two-body problem (5%)
Departmental ranking/reputation (4%)
Opportunity to make a scientific or product development impact (4%)

Cost of Living (2%)
Lack of colleagues working in the same research area (2%)
Access to quality graduate students (1%)
Publishing pressure (1%)
Space/research facilities/equipment (0%)
Don't know (0%)

How many faculty have left for industrial positions in the past three years?
Response: 17

How many faculty have you hired from industry in the past three years?
Response: 24
Net inflow from industry to academia: 7

What do you feel are the key faculty retention issues in your department?
Salary (51%)
Teaching load (32%)
General workload (30%)
Geography (26%)
Other (18%)
Tenure/promotion process (14%)
Space/research facilities/equipment (12%)
Cost of living (10%)
Two-body problem (9%)
Departmental ranking/reputation (6%)
Presence of colleagues working in the same area (5%)
Startup package (1%)
Opportunity to make a scientific or product development impact (0%)

When a faculty member presents an offer from another employer, how free are you to make counteroffers in the following areas?
Salary increase: No freedom (49%); Some freedom (25%);
Total freedom (<1%); Did not respond (26%).
Summer support: No freedom (41%); Some freedom (24%);
Total freedom (<1%); Did not respond (35%).
Decreased teaching load: No freedom (49%); Some freedom (21%);
Total freedom (0%); Did not respond (30%).
Leave of absence: No freedom (36%); Some freedom (33%);
Total freedom (4%); Did not respond (27%).

Demographic and Institutional Data

Institutional Control: Private 58%; Public 42%.

Highest Degree Offered: BA/AB/AS 73%; CA 1%; MA 24%.

Enrollment/Majors

Average Institutional Enrollment: 6,761

CS Students

Average CS Enrollment: 494

Average CS Grads: 26

MS Students

Average MS enrollment for schools with some MS students: 103

Average MS graduates for schools with some MS students: 22 per department

Faculty Totals, Composition, and Compensation

For CS/CE Faculty:

	FTE	# with PhD	# women	Avg. salary
Overall CS/CE Faculty	6.4	4.5	1.6	$53,896
Full Professor	2.3	1.4	0.18	$75,015
Associate Professor	2.1	1.5	0.37	$63,892
Assistant Professor	1.8	1.3	0.45	$56,036
Full-time Instructor/ Adjunct/Lecturer	1.45	0.2	0.4	$49,520

For all faculty:

What are your average salaries, for each rank, college-wide?

Full Professor	$66,999
Associate Professor	$54,858
Assistant Professor	$45,491
Full-time Instructor/Lecturer/Adjunct	$35,718

Total number of full-time faculty: 6.5 per institution.

Total FTE (full-time equivalent) number of part-time faculty: 2 per institution.

Faculty Teaching Loads

What is your expected college-wide faculty teaching load?

7.6 courses per academic year

What is your expected CS/CE faculty teaching load?

6.8 courses per academic year

Factors in Evaluating Faculty

How important a factor is research in evaluating faculty college-wide?

Most important 3%; Very important 33.3%; Important 38%; Not very important 19%; Not at all important 7%.

How important a factor is teaching in evaluating faculty college-wide?

Most important 69%; Very important 20%; Important 10%; Not very important 1%; Not at all important 0%.

How important a factor is research in evaluating CS/CE faculty?

Most important 4%; Very important 32%; Important 38%; Not very important 19%; Not at all important 7%.

How important a factor is teaching in evaluating CS/CE faculty?

Most important 66%; Very important 27%; Important 6%; Not very important 1%; Not at all important 0%.

APPENDIX C. SURVEY OF NEW HIRES

SURVEY METHODOLOGY

CRA contacted 50 recently-hired faculty members at doctoral-granting computer science departments and asked them to complete an online survey on faculty recruiting and retention. Of the 50 contacted, 34 completed the survey, a 68% response rate. Respondents were fairly well distributed among the tiers of graduate institutions: 59% received Ph.D.s from NRC-ranked schools 1-36; 21% from schools ranked 37-72; and 21% from schools ranked73-108. Of the respondents, 35% are currently employed at institutions ranked 1-36, 24% are at schools ranked 35-72, and the remaining 41% are at schools ranked 73-108.

ANALYSIS

- Respondents were largely male (74%) and either white (50%) or non-resident aliens (35%). The CRA Taulbee Survey, which polls the population of computer science faculty as a whole, reported 86% of Assistant- and Associate-level faculty, the two ranks the current survey addresses, are male, 58% are white, and 16% are non-resident aliens.
- Data on applications and offers point to a positive atmosphere for applicants. On average, applicants were invited to interview for one out of every 3.5 positions they applied for, and the average applicant was invited to interview for 6 different positions. The average applicant received 3.5 job offers, or one offer for every 6 applications submitted.
- Female respondents submitted far fewer applications than males, with only 6 applications per person compared to 25 per person for men.
- Breaking down the application, interview, and offer data by the tier of the applicant's graduate institution reveals some notable differences. As expected, Tier 1 graduates received more offers to interview and more job offers per person than graduates of Tier 2 and 3 institutions. In fact, Tier 1 graduates received more than twice as many invitations to interview and job offers than Tier 2 graduates. Interestingly, Tier 3 graduates did much better in both areas than their Tier

2 counterparts.

- Questions about applicants' decision criteria for positions to apply for revealed that departmental ranking/reputation (71%), geography (62%), the ability focus on research (41%) or balance research and teaching (38%) most often drove decisions on which positions to apply for. Access to quality graduate students (32%) and departmental morale/culture (24%) were also relevant decision criteria. The advice of peers and advisors was also an important factor in choosing positions to apply for. Among respondents, 85% said that the advice of peers was either "somewhat" or "very" important, although only 1% characterized the opinion of peers as one of the top four decision criteria. Recommendations from advisors were "somewhat," "very," or "most" important to 75% of applicants, although a comparatively small number (18%) reported that their advisor's opinion was one of the four most important factors in their decision.
- For those applicants who received multiple job offers, each of the job traits listed above remained important in the final decision, with the important addition of salary considerations. Salary was ranked by 29% as one of the top four factors in choosing which offer to accept, while 26% selected startup packages. Considering the overlap between respondents who included both salary and startup packages among their top four factors, 38% of applicants included one or the other as a decisive factor. Geography (41%), departmental ranking/reputation (38%), morale/culture (38%), and access to quality graduate students (24%) were the other considerations ranked most highly.
- When these responses are further categorized by gender, some differences in priorities become clear. For female new hires who received multiple job offers, the presence of colleagues in the same research area (44%) and access to quality graduate students (44%) were the most important factors in choosing a job, while these factors were much less important to males. Only 12% of male respondents ranked colleagues in their research area as one of their top four factors in choosing a position, and 20% included graduate students in that list. Departmental rankings and reputation were far more important for men—44% of men listed rankings as a top factor, while only 22% of women did. All other factors were roughly equal considerations for men and women
- Finally, we used the collected data to determine where candidates from each tier of graduate institutions ended up. By comparing the NRC rankings of the institutions that hired the respondents with the ranks of their graduate institutions, we found that the average Tier 1 graduate moved down almost a full tier, while Tier 2 graduates stayed in roughly the same tier and Tier 3 graduates moved up a half tier. In general, there is some downward movement for Tier 1 and 2 graduates, and upward movement for Tier 3 graduates. Significantly, although only 21% of respondents received their Ph.D.s from Tier 3 institutions, 41% ended up employed by those institutions. This indicates that there is at least some overall "trickle down" of Ph.D.s from the higher- to lower-ranked institutions.

RESULTS

Demographic Information

Current Rank: 1 Associate, 33 Assistant

Gender: 9 Female, 25 Male

Ethnicity: 17 White; 12 Nonresident alien; 3 Asian; 1 African-American; 1 Other

Graduate Institution:
Tier 1 (NRC ranks 1-36): 59%; Tier 2 (NRC ranks 37-72): 21%;
Tier 3 (NRC ranks 73-108): 21%.

Applications and Offers

Number of Applications Submitted:
22 applications per person
For women: 6 applications per person
For men: 25 applications per person

Interviews: 203 total; 6 interviews per person, 1 interview per 3.5 applications

Interviews and Offers by Graduate Institution Rank:

Tier 1 (NRC Rank 1-36)
(n=20)
8 interviews per person; 4.3 offers per person

Did you receive a job offer from your first-choice academic institution?
Yes: 26%; Didn't have a first choice: 53%; No: 26%.

By gender:
Male: 9.2 interviews per person, 4.8 offers per person
Female: 4.6 interviews per person, 3.3 offers per person

Tier 2 (NRC Rank 37-72)
(n=7)
3.6 interviews per person; 1.9 offers per person

Did you receive a job offer from your first-choice academic institution
Yes: 43%; Didn't have a first choice: 43%; No: 14%.

By gender: No females

Tier 3 (NRC Rank 73-108)
(n=7)
4.4 interviews per person; 3 offers per person
(Excluding outliers: 2.7 interviews per person, 2 offers per person)

Did you receive a job offer from your first-choice academic institution?
Yes: 71%; Didn't have a first choice: 29%; No: 0%.

By gender: Sample size too small

Decision Criteria

Did you apply for industrial positions as well as academic positions?
No (74%); Yes (26%)

What were the four most important criteria in choosing the academic positions you applied for?
Departmental ranking/reputation (71%)
Geography (62%)
Ability to focus on research (41%)
Ability to balance teaching and research focus (38%)
Departmental morale/culture (38%)
Access to quality graduate students (32%)
Ability to find employment for spouse or partner (24%)
Presence of colleagues in the same research area (21%)
Recommendation of advisor (18%)
Salary (18%)
Strong institutional support for your department (18%)
Startup package (15%)
Ability to focus on teaching (1%)
Space/research facilities/equipment (1%)
Recommendation of peers (1%)
Publishing pressure (1%)
Cost of living (0%)
Access to quality undergraduate students (0%)

How important was the advice of peers in deciding which academic positions to apply for?

Most important (0%); Very important (29%);
Somewhat important (56%); Not important (15%.)

How important was the advice of your advisor in deciding which academic positions to apply for?

Most important (6%); Very important (39%);
Somewhat important (30%); Not important (25%).

If you received multiple job offers, which factors were most important in choosing your current academic position?

(Select the four most important factors from the options below.)

Geography (41%)
Departmental ranking/reputation (38%)
Departmental morale/culture (38%)
Salary (29%)
Startup package (26%)
Access to quality graduate students (24%)
Strong institutional support for your department (21%)
Ability to focus on research (21%)
Ability to balance teaching and research focus (21%)
Presence of colleagues in the same research area (21%)
Other (15%)
Recommendation of advisor (12%)
Ability to find employment for spouse or partner (9%)
Space/research facilities/equipment (1%)
Recommendation of peers (1%)
Cost of living (0%)
Ability to focus on teaching (0%)
Access to quality undergraduate students (0%)
Ability to get tenure (0%)
Publishing pressure (0%)

If you received one or more offers for industrial positions, which factors caused you to choose an academic position instead?

Freedom to choose own research agenda and projects (63%)
Freedom to publish/submit conference papers/be a part of the professional community (63%)
Access to quality graduate students (50%)
Tenure/job security (38%)
Ability to balance research and teaching focus (25%)

Access to quality undergraduate students (13%)
Geography (13%)
Presence of colleagues in the same research area (13%)
Ability to find employment for spouse or partner (13%)
Recommendation of peers (13%)
Recommendation of advisor (13%)
Startup package (13%)
Cost of living (13%)
Ability to focus on teaching (0%)
Ability to focus on research (0%)
Salary (0%)
Space/research facilities/equipment (0%)

Movement Through the Ranks

(Determined by calculating the difference between each respondent's graduate institution rank and the rank of the institution that hired him/her).

Graduates of Tier 1 institutions:

(n = 20)
Average Tier 1 grad went to Tier 1.75 institution.
50% stayed at the same tier, 50% moved down at least one tier.

Graduates of Tier 2 institutions:

(n = 7)
Average Tier 2 grad went to Tier 2.1 institution.
14% moved up one tier, 57% stayed at same tier, 29% moved down one tier.

Graduates of Tier 3 institutions:

(n = 7)
Average Tier 3 grad went to Tier 2.4 institution.
43% moved up at least one tier, 57% stayed at the same tier.

Composition of Academic Institutions by Graduate Institution Rank

Tier 1 schools:

83% are graduates of Tier 1 institutions
8% are graduates of Tier 2 institutions
9% are graduates of Tier 3 institutions

Tier 2 schools:

25% are graduates of Tier 1 institutions
50% are graduates of Tier 2 institutions
25% are graduates of Tier 3 institutions

Tier 3 schools:

58% are graduates of Tier 1 institutions
17% are graduates of Tier 2 institutions
25% are graduates of Tier 3 institutions

APPENDIX D. SURVEY OF ACADEMIC RECENT JOB CHANGERS

SURVEY METHODOLOGY

Sixty-four computer science faculty members who moved from one academic institution to another in the past three years were asked to complete an online survey on faculty recruitment and retention. Of the invitees, 38 completed the survey, a 60% response rate. Respondents' institutions were well distributed among the NRC ranks: 35% represented NRC-ranked schools 1-36, 24% worked for schools ranked 37-72, and 41% for schools ranked 73-108.

ANALYSIS

- Respondents were mainly male (79%) and either white (53%) or Asian (26%). The CRA Taulbee Survey, which polls the population of computer science faculty as a whole, reported that 92% of Full Professors and 86% of Associate Professors, the two ranks the current survey addresses, are male; 76% and 71% are white; and 16% and 21% are Asian.
- Data on applications and offers point to a positive atmosphere for applicants. On average, respondents submitted 5.2 applications each, and received 3.1 offers to interview each, or 1 interview offer per 1.8 applications. The average applicant received 2.1 job offers, or one offer for every 2.6 applications submitted.
- When asked to select their four most important reasons for leaving their previous position, respondents chose access to quality graduate students (47%), departmental morale/culture (42%), departmental ranking (40%), and salary (37%) most often. Though similar in most other areas, 43% of males selected "salary" as a reason for leaving, while only 13% of females did; and 43% of males selected "departmental ranking/reputation," while only 25% of females did. This split is mirrored in both the "new hires" survey and the data on decision criteria for job applications discussed below.
- Questions about the criteria applicants used when deciding what positions to apply for revealed that departmental ranking/reputation (70%) and access to quality graduate students (57%) were dominant selection criteria. The presence

of colleagues in the same research area (38%), geography (38%), and departmental morale/culture (35%) were also important factors. Male and female responses were fairly even in most areas, but men valued salary (28% to 0%) and departmental rankings (76% to 50%) more highly than women.

- For those applicants who received multiple job offers, each of the job traits listed above remained important in the final decision, with the important addition of salary considerations. Salary was ranked by 40% of respondents as one of the top four factors in choosing which offer to accept, while 7% selected startup packages. The ability to find employment for a spouse or partner (33%) was also a major deciding factor.
- Because this survey deals with faculty who have left another academic institution, we asked how, if at all, their previous department tried to prevent them from leaving. Additional salary was the major incentive to stay in most cases (42%). Simple persuasion, without any tangible incentive or change, was another popular response (24%). The 37% of respondents who selected "other" described a wide range of departmental reactions, all of which ultimately failed. Of respondents, 47% said that nothing their department could have done would have convinced them to stay.
- Finally, we used the collected data to determine where candidates from each tier of academic institutions ended up. By comparing the NRC rankings of the institutions that hired the respondents to the rankings of their former employers, we found that the average Tier 1 employeemoved a third of a tier down, while Tier 2 employees moved two-thirds of a tier up, and Tier 3 employees moved up three-quarters of a tier. In general, there is some downward movement for Tier 1 employees, and upward movement for Tier 2 and 3 graduates. Only 7% of respondents moved down a tier, however, and none moved down more than one tier. No respondent moved from industry to a Tier 3 institution.

RESULTS

Demographic Information

Current Rank: 15 Professors; 21 Associate; 1 Assistant.

Gender: 8 Female; 29 Male.

Ethnicity: 20 White; 9 Asian; 4 Other; 3 Nonresident alien; 1 Hispanic; 0 African American.

Current Institution:
Tier 1 (NRC ranks 1-36): 35%
Tier 2 (NRC ranks 37-72): 24%
Tier 3 or unranked (NRC ranks 73-108): 41%

How many tenure/tenure-track jobs have you held, including your current position?

0 positions:	2	3 positions:	8
1 position:	7	4 positions:	1
2 positions:	19	5 positions:	1

Applications and Offers

Number of Applications submitted:

5.2 applications per person; 47% submitted 2 or less applications.
For women: 5.6 applications per person; For men: 5.1 applications per person.

Interviews: 107 total; 3.1 interviews per person; 1 interview per 1.8 applications.

Decision Criteria

Did you leave your immediately previous position because you were denied tenure?

Yes (0%); No (100%).

Why did you leave your immediately previous position?

Select the four most important reasons from the options below.

	Overall	Male	Female
Access to quality graduate students	47%	46%	50%
Departmental morale/culture	42%	43%	38%
Departmental ranking/reputation	40%	43%	25%
Salary	37%	43%	13%
Presence of colleagues in same research area	29%	27%	38%
Geography	26%	27%	25%
Inadequate institutional support for your dept.	21%	20%	25%
Ability to find employment for spouse/partner	18%	17%	25%
Desire to balance teaching and research focus	18%	20%	13%
Desire to focus on research	11%	7%	25%
Cost of living	5%	3%	0%
Recommendation of peers	5%	7%	0%
Space/research facilities/equipment	5%	7%	0%
Access to quality undergraduate students	3%	3%	0%
Startup package	3%	3%	0%
Desire to focus on teaching	0%	0%	0%
Recommendation of advisor	0%	0%	0%
Publishing pressure	0%	0%	0%

Did you apply for industrial positions as well as academic positions?

No (89%); Yes (11%)

If you received one or more offers for industrial positions, what attracted you most to industry?

Select the three most important factors from the options below.

Stock options/Employee Stock Purchase Plan (50%)
Salary (25%)
Less grant-writing demand (25%)
No teaching requirement (25%)
Presence of colleagues working in the same research area (25%)
Less committee work (0%)
Less publishing demand (0%)
Better access to research materials (e.g., databases for data mining research) (0%)
Better space/facilities (0%)
Better support staff (0%)

What were the most important criteria in determining which academic positions to apply for?

Select the four most important criteria from the options below.

	Overall	Male	Female
Departmental ranking/reputation	70%	76%	50%
Access to quality graduate students	57%	59%	50%
Presence of colleagues in same research area	38%	35%	50%
Geography	38%	35%	50%
Departmental morale/culture	35%	38%	25%
Ability to find employment for spouse/partner	24%	24%	25%
Salary	22%	28%	0%
Ability to focus on research	22%	21%	25%
Ability to balance teaching and research focus	11%	10%	13%
Strong institutional support for your dept.	8%	10%	0%
Cost of living	8%	10%	0%
Recommendation of peers	5%	7%	0%
Space/research facilities/equipment	5%	7%	0%
Access to quality undergraduate students	5%	3%	12%
Startup package	5%	3%	0%
Ability to focus on teaching	0%	0%	0%
Recommendation of advisor	0%	0%	0%
Publishing pressure	0%	0%	0%

Did you receive a job offer from your first-choice academic institution?

Yes (74%); No (3%); Didn't have a first choice (23%).

By gender:

Men (n=27): Yes (67%); No (4%); Didn't have a first choice (29%).

Women (n=8): Yes (100%); No (0%); Didn't have a first choice (0%).

If you received multiple academic job offers, which factors were most important in choosing your current position?

Select the four most important factors from the options below.

Departmental ranking/reputation (60%)
Geography (47%)
Access to quality graduate students (47%)
Salary (40%)
Presence of colleagues in the same research area (40%)
Departmental morale/culture (33%)
Ability to find employment for spouse or partner (33%)
Ability to focus on research (20%)
Strong institutional support for your department (15%)
Recommendation of peers (13%)
Ability to balance teaching and research focus (7%)
Cost of living (7%)
Space/research facilities/equipment (7%)
Startup package (7%)
Ability to focus on teaching (0%)
Access to quality undergraduate students (0%)
Publishing pressure (0%)
Recommendation of advisor (0%)
Ability to obtain tenure (0%)

When your previous department learned that you were leaving or considering leaving, what was their response?

Select all applicable choices.

Offered more salary (42%)
Attempted to persuade you to stay, but did not offer additional incentives (24%)
No action by department (13%)
Offered lower teaching load (8%)
Offered tenure (5%)
Offered summer support (3%)
Offered sabbatical (3%)
Other (37%)

"Other" responses included:

- Asked "What can they do to convince me to stay?"
- At first they did not make a counteroffer, and then as they realized I was serious, did so.
- Goodbye and good luck.
- Offered housing loans.
- Offered me Associate Dean position.
- Offered to buy a house.
- Offered to create a university research institute for me.
- Offered to find another department head to replace me.
- Exploring a more flexible work environment (e.g., telecommuting support, remote office space, and so forth).

Which of these responses was the most persuasive to you?

More salary (16%); Lower teaching load (2%).

Why was your department's response ultimately inadequate to persuade you to stay?

- Couldn't change the departmental culture.
- Given the huge difference in ranking/reputation, my previous institution knew that nothing they would offer could really make me stay.
- I wanted to work at the same institution as my spouse, and I was curious to try an academic environment after several years in industrial research.
- I was determined to move to academia.
- Lack of quality grad students and the poor research promise of department.
- Department reputation, plus child's education.
- My decision to leave is purely for family concern.
- None. I had already decided to leave. The change in culture to a major research institution was going to take too long.
- They did not help in finding a position for my spouse.
- Lack of employment opportunities for spouse.
- Overall department morale was low due to inadequate university support over a period of years.

What, if anything, could your department or institution have done to prevent you from leaving?

- Nothing (47%)
- Demonstrate stronger institutional support for my department and for my research institute.
- Fired the president.
- Nothing. Even an offer to be considered as chair at that institution would not have been attractive because I did not see the vision for growth from the administration.

- Better institutional support. Willing to invest and hire in new areas.
- Offered a modest salary increase.
- Helped in finding a position for my spouse.
- Promoted me to Professor.
- Kept salaries in a reasonable range.

Movement Through the Ranks

(Determined by calculating the difference between each respondent's immediately prior employer ranking and the ranking of their current institution).

Employees coming from Tier 1 institutions (n = 7):
Average Tier 1 employee went to Tier 1.29 academic institution

Employees coming from Tier 2 institutions (n = 8):
Average Tier 2 employee went to Tier 1.33 academic institution

Employees coming from Tier 3 institutions (n = 5):
Average Tier 3 employee went to Tier 2.15 academic institution

Employees coming from industry (n = 8):
Average industry employee went to Tier 1.38 academic institution

Composition of Academic Institutions by Immediately Prior Employer Institution Ranking

Tier 1 schools: 26% came from Tier 1 institutions
32% came from Tier 2 institutions
16% came from Tier 3 institutions
26% came from industry

Tier 2 schools: 15% came from Tier 1 institutions
23% came from Tier 2 institutions
39% came from Tier 3 institutions
23% came from industry

Tier 3 schools: 0% came from Tier 1 institutions
0% came from Tier 2 institutions
100% came from Tier 3 institutions
0% came from industry

APPENDIX E. SURVEY OF FACULTY SEARCH COMMITTEES

SURVEY METHODOLOGY

CRA contacted chairs of 30 Ph.D.-granting computer science departments and asked them or the heads of their current faculty search committees to complete an online survey on faculty recruitment and retention. Of the 30 invitees, 21 completed the survey, a 70% response rate. Respondents were somewhat skewed towards the top tier of graduate institutions, with 52% from NRC-ranked schools 1-36, 19% from schools ranked 37-72, and 29% from schools ranked 73-108.

ANALYSIS

- While the previous surveys (new hires and job changers) showed a very positive atmosphere for applicants, responses from search committees portray a more restrained environment. The new hires survey showed that, on average, applicants were invited to interview for one out of every 3.5 positions they applied for, and the average applicant was invited to interview for 6 different positions. The average applicant received 3.5 job offers, or one offer for every 6 applications submitted. The search committee chairs, however, reported extending only one interview for every 12.7 applications received, and one offer for every 43 applications. These differences seem greater than normal variance could account for, and may indicate that our previous sample of new hires was skewed towards more attractive candidates (by definition, the new hires were at least qualified for one position, which may differentiate them from some of the applicants the search committees draw from).
- There is a clear difference between the number of applications received by Tier 1 (NRC rank 1-36) and Tier 3 (NRC rank 73-108) institutions, with Tier 1 schools receiving 43% more applications than Tier 3.
- When asked for the most important factors in choosing applicants to interview, search committee chairs ranked “area/needs” first (with 67% ranking this first

or second), followed by "number of quality papers" and "letters of recommendation" (62% ranking first or second for both).

- We were interested in anecdotal reports that large numbers of applications were obviously unviable, with the applicant having little or no chance of receiving an interview. With this in mind, we asked for the distinguishing characteristics of both good and bad applications, and received a variety of answers. Marginal applications included a weak publication record, poor matches with the needs of the department, degrees from lower-ranked institutions, and poor written and interpersonal skills. Potentially viable applications indicated broad interests, a clear research agenda, a good publication record, solid recommendation letters from respected scholars, and a strong graduate institution.
- Several questions asked search committee chairs how they valued different types of applicants, in particular candidates who are of very high quality overall but a poor match for the area needs of a department, and candidates who are women and underrepresented minorities. In the first case, responses were mixed, with several search chairs indicating that they would ignore area needs for a high-quality candidate, and others saying they would either not even interview poor area matches, or ultimately choose a lower-quality but more suitable applicant. Of respondents, 76% said they screen for women and underrepresented minorities, meaning they flag those applications and pay special attention to them. Some respondents indicated that female/URM status is a significant primary consideration, while others said that such status would only come into play after academic credentials were found to be comparable.
- Anecdotal accounts of departments waiting a long time for their first-choice candidate to decide and then losing a second choice when the first fell through prompted us to ask several questions about this scenario. Of respondents, 67% reported losing a second choice after waiting an extended period for their first choice to decide, and 20% said this happened "frequently" or "very frequently" (with another 53% responding "occasionally"). On the other hand, most departments reported success in getting their first choice; of their last five hires, 75% were a first choice.
- Our results provide no solid evidence that lengthening the search process or extending multiple offers for each position significantly improve recruiting. Searches lasting 3 to 5 months resulted in an 80% fill rate, 6 to 7 months an 82% fill rate, and 8 to 10 months a 67% fill rate. Departments that extended multiple offers filled 79% of their positions, while other departments filled 74% of available positions. Though this is not a substantial improvement, many chairs expressed the belief that multiple offers increased their chances of landing a quality recruit.
- Lastly, we asked search committee chairs why they did not fill all of their open positions. For the 23% of positions that remained open, 50% went unfilled because there was no acceptable candidate, while another 25% were left open

after the department made an offer, waited for a reply, and then lost their next choice. When asked to consider the strongest candidate to which they did not make an offer, 62% did not make an offer because of another, stronger candidate, 33% thought it was unlikely the candidate would accept, and 24% did not believe the candidate would raise the level of their faculty.

RESULTS

Open Positions

21 institutions reported 69 open positions, or 3.3 open positions per school.

By department rank:
Tier 1 (NRC ranks 1-36): 3.4 open positions per school
Tier 2 (NRC ranks 37-72): 4.8 open positions per school
Tier 3 or unranked (NRC ranks 73-108): 2.2 open positions per school

Applications and Offers

Number of Applications received: 57 applications per open position

By department rank:
Tier 1 (NRC ranks 1-36): 67 applications per open position
Tier 2 (NRC ranks 37-72): 54 applications per open position
Tier 3 or unranked (NRC ranks 73-108): 47 applications per open position

Interviews:

Overall, institutions extended 4.5 offers to interview for each open position. 7.9% of applications led to an interview (1 interview for every 12.7 applications).

Offers:

Overall, institutions extended 1.4 offers per open position.
3.4 interviews per offer
30% of interviews led to an offer
2.3% of applications led to an offer

In general, what were the most important factors in choosing interviewees?

Rank order each from 1 to 5. The factor ranked "1" is the most important.

Least Important	Most important				
Factor	**1**	**2**	**3**	**4**	**5**
Number of quality papers in quality journals or conferences	33%	29%	14%	14%	24%
Letters of recommendation from advisors	38%	24%	19%	19%	0%
Graduate school ranking/reputation	19%	38%	5%	24%	10%
Area/needs	43%	24%	24%	5%	5%
Other	0%	0%	0%	0%	0%

If you ranked "Number of quality papers in quality journals or conferences" 1, 2, or 3, how do you determine if a paper is "quality"?

- As perceived by senior people in the field.
- Knowledge of conferences in the area; sometimes by reading the paper; from letters of reference.
- Based on which conferences/journals the paper is published in.
- We know the conferences and read the individual papers.
- Reading it.
- Have our faculty in the related research area evaluate the quality of the papers.

How do you determine that a journal or conference is "quality"?

- Faculty familiarity with the literature and journal selectivity; conferences must be refereed-reviewed.
- Based on the opinion of our existing faculty.
- Reputation among peers; composition of editorial board and program committee; acceptance rates.
- Knowledge of the conferences from current faculty.
- Faculty in the relevant area.

How important are interviews in evaluating candidates?

Very important (100%); Somewhat important (0%); Not important (0%).

What do you hope/expect to see in a candidate's interview?

- Innate curiosity about a variety of fields; desire for collaboration; interest in working across traditional boundaries.
- Teaching ability. Ability to think and speak. Personality.

- Solid foundation, scientific thinking, creativity, articulate.
- People who are capable of good teaching, who seem to be interested in working with the existing faculty, and who can think on their feet.
- Confidence, maturity, good academic citizenship.
- Smarts, capability, excitement, high interest level, maturity.
- Ability to communicate at several levels: personal, with a group, in a seminar.
- Verification of resume.
- Does this person have good people, presentation, and interaction skills?
- Maturity; a vision of early scholarship and funded research path(s); interest in teaching and working with students at BS, MS, and doctoral levels; indication of collegial attitudes; interest/indication of being a team player; interest in our program and environment.

How important are talks in evaluating candidates?

Very important (81%); Somewhat important (19%); Not important (0%).

What do you hope/expect to see in a candidate's talk?

- Ability to organize presentations clearly; some levels of experience and sophistication in using visual aids; clarity of expression; ability to respond to informed and not-so-informed questions; humor helps.
- Find compatibility with our needs; ensure the candidate can defend his/her work; gauge level of interest by existing faculty.
- Depth of knowledge and ability to present complex ideas to a fairly general audience.
- Teaching potential; verbal skills; handling questions.
- Clarity, depth of knowledge, ability to make ideas clear.
- Importance of research problem, candidate's expertise, teaching ability.
- The talk should demonstrate an excellent technical presentation capability, and reflects an apparent competence of doing innovative research.
- Ability to be a strong teacher; depth and importance of research; ability to explain what he/she is doing.
- Clear statement of a problem; clear explanation of the solution; honest assessment of the solution; context to enable audience to understand the contribution.

What are the distinguishing characteristics of an obviously unviable application?

Poor publications (38%); Poor area fit (19%);
Graduate school reputation/ranking (14%)

Comments included:

- Weak or no publications; weak letters.
- Poor area match. Degree far outside CS. Very weak school.
- Poor publication record (often very poor outlets).
- Talk incomprehensible or poorly organized or presented; interactions that annoy people; superficial research.

- People with poor presentation skills, who cannot answer simple questions smoothly, and who do not seem to have a concrete idea of the direction his/her research.
- Area of interest; graduate school ranking.
- Few publications, not a major university, research outside of normal areas.
- Glaring uncorrected technical errors in faculty meetings or seminar presentation; lack of enthusiasm (or at least some demonstration of it) in their research area; poor interpersonal skills.

What are the distinguishing characteristics of a potentially viable application?
Strong publications (43%); Research record (19%); Graduate school reputation (14%); Strong letters (14%); Broad research interests (10%); Area fit (10%).

Comments included:
- Informed and broad interests; solid interpersonal skills; clear vision of near-term research agenda; some accurate information about department and specific knowledge of faculty with whom candidate interests overlap.
- Good publication record; coming from a good department/school; Advisor's fame.
- Sense of research direction, fit with existing efforts, communication skills.
- Solid list of published research articles (some as principal author and some as collaborative author).
- Knows research area and presents it well.
- Strong technical ability, clearly articulated research plan, charm.
- Excellent school, good letters, publications.
- People who present well, who ask deep (non-canned) questions, and who have some "concrete good ideas" of where they want to go next.
- Good publications in extremely competitive conferences (often 10%-20% acceptance rates, recognized best conferences and papers).

How do you handle the tradeoff between the general quality of an applicant and his/her ability to match your need in a specific research/teaching area? In other words, if a candidate is of very high quality but in the wrong area, how do you value them?

- We typically value candidate quality over area needs.
- We consider very strong candidates even if the area match is not ideal.
- If he/she is a potential "walk-on-water" person, we will interview him/her anyway. We have a special "at-large" committee set up to handle such candidates.
- Very highly, unless in a very few areas that we are explicitly not investing in.
- We wouldn't hire in the wrong area.

- We try not to interview candidates in "wrong" areas. Our department is too small to afford such hires.
- Key thing is quality of applicant; beyond that, area comes into play.
- If a case can be made that the applicant is a "star," being in the wrong area, while reducing the likelihood of hire, does not preclude it.
- We have desperate needs in certain areas and we would not interview someone who does not meet them unless they are from a minority group. We would hire a minority candidate outside our needs.
- Strong candidates in all areas are given serious consideration; about 1/3 of applicants invited fall into this category.
- With great pain and difficulty. If in an area in which we are "overstaffed," would likely pass; if in any other area would likely (and have) made offer of a tenure-track position.

Do you specifically screen the applicant pool for female and underrepresented minority candidates? (An example would be flagging such applications as they come in and then evaluating the list of those invited to interview with flagged applications in mind.)

Yes (76%); No (24%).

Briefly explain your answer:

- We take note of candidates from the underrepresented group and will take some liberties in our normal standards if a candidate seems likely to meet most of our expectations. We do not invite candidates for an on-campus interview unless we believe there is a good chance of hiring them.
- The first level of screening is based on quality and needs.
- We are only interested in the academic credentials.
- We add underrepresented as factor in the metric used when deciding whom to invite.
- Preference is given to female and underrepresented minority candidates in setting interviews.
- The search committee did not, but I instructed them to go back and do that.
- We flag them; we almost always ask for letters; we try to interview them whenever possible.
- We are especially careful not to miss highly qualified candidates from this pool.
- To do so is probably illegal.
- During the search process, we make sure every female and minority application has been carefully reviewed and that we have explicit and well reasoned explanations as to why the candidate is not being interviewed/hired (if they aren't).

Do members of the search committee pre-screen applicants before the interview?
If yes, in which of the following ways do you so? Select all that apply:

Speak to or email candidate (52%)
Speak to or email candidate's advisor (43%)
Do not contact/pre-screen applicants (24%)
Other (24%)
Go to a public talk/conference to see candidate (19%)

"Other" responses included:

- Talk to letter-writers.
- Intense look at CV, talk to faculty in area, study letters of recommendation, etc.
- Call references.
- If there is no indication that the application should be treated as confidential, we will check with friends and colleagues in the applicant's department or closely affiliated departments.

Search Processes and Results

When your faculty search committee evaluates applicants, is there usually significant unanimity on who the leading candidates are?

Yes (86%); No (14%).

In which month do you start and end a search? Use the time between the posting date for a position and the date the position is either closed or the search is suspended.

Start: August (5%); September (19%); October (9%); November (19%); December (43%); January (5%).

End: February (9%); March (14%); April (10%); May (48%); June (14%); July (5%).

How long do you give candidates to decide on an offer?

2 to 4 weeks (67%); 3 to 6 weeks (10%); Flexible (23%).

How do you react when a candidate you have interviewed pushes you for a decision?

- It depends on how quickly the candidate wants a decision, how early/late we are in the process, and how strongly we feel about the candidate. We do make offers before we have completed the entire interview roster, but always retain at least one open slot.
- Depends on how badly we want the candidate; usually try to make a quick decision if need be.

- Give the facts regarding our decision process. Ask candidate to request extension for other offers.
- Give them a time frame in which we will make our decision.
- Not an issue: decisions are made rapidly for top candidates.
- Positively—we understand their needs.
- Try to respond in a way to keep the candidate interested.
- We explain up front what our timetables and constraints are. Generally the university will not provide us with any flexibility beyond this.
- We try to give them one of three answers immediately: 1) We are not considering your case further; 2) The paperwork isn't final, but we expect to make you an offer; 3. You are still under strong consideration, and we can give you more concrete feedback soon.

Have you lost second-choice candidates because you waited a long time for your first choice to decide?

Yes (67%); No (33%).

If "yes," how frequently does this occur?

(n = 15): Very frequently (7%); Frequently (13%); Occasionally (53%); Almost never (27%).

Of your last 5 hires, how many were your first-choice candidates?

Schools hired their first-choice candidate 75% of the time.

Were you permitted by your Dean to make more offers than you had open positions?

Yes (52%); No (48%)

By department rank:

Tier 1: Yes (82%), No (18%); Tier 2: Yes (25%), No (75%); Tier 3: Yes (17%), No (83%).

If yes, did you take advantage of that opportunity?

Yes (100%); No (0%)

What was the outcome of this decision?

- Increased our chances, never exceeded number of open slots.
- It increased the probability of filling all the slots.
- Hired the original number planned.
- Sometimes we get people we might not otherwise have gotten; other times, it didn't make a difference.
- We overbid; but we only choose candidates we want. So in some sense we just have more #1 choices that year. We never go to #2 on our list.

- Once we got 2 candidates where one was expected; once we got one of our top two candidates.
- We hired 2 excellent people.

How would the university handle a situation in which all the offers were accepted, leaving you with more new faculty than open positions?
- Would never happen.
- Honor the offers.
- They would give us the positions from future hires; would result in change in how many offers can be made.
- We would borrow from next year.
- No problem; budget is approved for these.
- Most likely the department's open positions next year will be cut accordingly.
- We got some bulges to cover the gaps and it affected future hiring. It also was a strategy that let us grow the department beyond the projection.
- We'd accept the new faculty and be more careful in the future.

Hiring Decisions and Outcomes

Is your search complete for the 2000-2001 academic year?

Yes (67%); No (33%)

How many unfilled openings did you have at the end of your search?

77% of open positions were filled.

By department rank:

Tier 1: 81% filled; Tier 2: 68% filled; Tier 3: 77% filled.

Which best describes the reason the position was not filled?

No acceptable candidate; did not make offer (50%).

Made offer(s) which was/were declined; missed chance to make offer(s) to other acceptable candidate(s) (25%).

Another scenario (25%).

Made offer which was declined; no other acceptable candidates (0%).

Consider the strongest candidate(s) to which you did NOT make offers. Why did you not make offers to them? Please select all that apply.

Another candidate was stronger (62%)

Judged unlikely they would accept (33%)

Would not raise the level of our faculty (24%)

Didn't think person would fit socially in the department (19%)

Other (19%)

Unable to do the job (5%)

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Additional copies of this report are available from CRA:

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