2001-2002 Taulbee Survey

Survey Results Show Better Balance in Supply and Demand

By Moshe Y. Vardi, Tim Finin, and Tom Henderson

This article and the accompanying figures and tables present the results of the 32nd annual CRA Taulbee Survey[1] of Ph.D.-granting departments of computer science (CS) and computer engineering (CE) in the United States and Canada. This survey is conducted annually by the Computing Research Association to document trends in student enrollment, employment of graduates, and faculty salaries.

Information is gathered during the fall and early winter. The period the data cover varies from table to table. Degree production (Ph.D., Master's, and Bachelor's) and total Ph.D. enrollments refer to the previous academic year (2001-2002). Data for new students in all categories and total enrollments for Master's and Bachelor's degrees refer to the current academic year (2002-2003). Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2003. Responses received by January 3, 2003 are included in the analysis.

The data were collected from Ph.D.-granting departments only. A total of 225 departments were surveyed, compared with 215 departments last year. As shown in Figure 1, 182 departments returned their survey forms, for a response rate of 80 percent (the same as last year). The return rate of 10 out of 28 (36%) for Computer Engineering (CE) programs is very low, as has been the case for several years (see below). We attribute this low response to two factors: 1) many CE programs are part of an ECE department, and they do not keep separate statistics for CE vs. EE; and 2) many of these departments are not aware of the Taulbee Survey or its importance. The response rate for US CS departments (150 of 170, or 88%) was very good, as was the 82% response rate for Canadian programs. We thank all respondents who completed this year's questionnaire. Departments that participated are listed at the end of this article.

The set of departments responding is somewhat different each year (10 more departments responded this year); thus, we must approach any trend analysis with caution. Due to the low return rate for CE departments, the same caveat applies to the CE data. In our discussion, we will focus on the combined numbers for CS and CE. Because of the low return rate for CE, the CRA board has decided to combine the CS and CE data in future Taulbee Surveys and not offer separate data for CE.

Figure 1. Number of Respondents to Faculty Salary Questions

Year	US CS Depts.	US CE Depts.	Canadian	Total
1995	110/133 (83%)	9/13 (69%)	11/16 (69%)	130/162 (80%)
1996	98/131 (75%)	8/13 (62%)	9/16 (56%)	115/160 (72%)
1997	111/133 (83%)	6/13 (46%)	13/17 (76%)	130/163 (80%)
1998	122/145 (84%)	7/19 (37%)	12/18 (67%)	141/182 (77%)
1999	132/156 (85%)	5/24 (21%)	19/23 (83%)	156/203 (77%)
2000	148/163 (91%)	6/28 (21%)	19/23 (83%)	173/214 (81%)
2001	142/164 (87%)	8/28 (29%)	23/23 (100%)	173/215 (80%)
2002	150/170 (88%)	10/28 (36%)	22/27 (82%)	182/225 (80%)

For more details on how the faculty salary information (Tables 27-34) is to be interpreted, see the article in the January 2003 *CRN* on Preliminary Taulbee Faculty Salary Data (http://www.cra.org/CRN/articles/jan03/vardi.finin.henderson.html).

The survey form itself is modified slightly each year to ensure a high rate of return (e.g., by simplifying and clarifying), while continuing to capture the data necessary to understand trends in the discipline and also reflect changing concerns of the computing research community. In previous years, Tables 27-34 have only reported the mean salaries. We believe, however, that for aggregating data the median is more meaningful than the mean, since it is less skewed by outlying data points. This year we have included both mean and median salaries to facilitate comparison with previous Taulbee Surveys. In future surveys, however, we intend to report only median salaries. Departments will be asked to provide only the minimum, median, and maximum salaries.

Ph.D. Degree Production and Enrollments (*Tables 1-8)*

As shown in Table 1, a total of 849 Ph.D. degrees were awarded in 2002 by the 182 responding departments. As Figure 2 indicates, this is the lowest number since 1989. Most likely this number is still reflecting the high-tech boom of the late 1990s, when start-up companies presented an extremely attractive employment option for computer scientists.

The prediction from last year's survey that 1,205 Ph.D. degrees would be awarded in 2002 was, as usual, overly optimistic, with an "optimism" ratio, defined as the actual over the predicted, being 0.70. Given next year's prediction of 1,224 graduates (Table 1), we predict the actual number will be between 850 and 950.

All other numbers indicate a strong growth in the Ph.D. supply in the next few years. The number entering Ph.D. programs (Table 5) increased from 2,702 to 3,286 (22%). The number who passed qualifiers (Table 1) increased from 1,244 to 1,375 (11%), but the number who passed thesis proposal exams (Table 1) decreased slightly from 917 to 884 (-4.0%). Total Ph.D. enrollment (Table 6) increased from 8,810 to 10,021 (14%). Looking beyond our survey results, some CS programs are reporting record numbers of applicants to their Ph.D. programs this year. It seems that the failure of the dot-com boom has convinced many recent Bachelor's and Master's degree recipients to return to graduate school.

Table 4 shows area of specialization versus types of first appointments for Ph.D. recipients in 2002. The table shows a marked shift from industrial to academic employment. More than 52% of fresh Ph.D.s found academic employment (43% last year) and only 38.2% found industrial employment (49% last year). There has also been a non-negligible increase in the number of postdoctoral positions (from 56 to 83).

Most statistics on gender and ethnicity for Ph.D. students (Tables 2, 3, 7, 8) show remarkably little change from last year. White and nonresident-alien men continue to account for a very large fraction of our Ph.D. production and enrollments. Women constitute a significant minority (19% of enrollments, 18% of graduates.) All other underrepresented groups are very small minorities. As Figure 3 illustrates, we see a slight decrease in the proportion of enrolled Ph.D. students who are nonresident aliens, probably reflecting an increased interest in Ph.D. programs by U.S. students.

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Figure 2. PhD Production

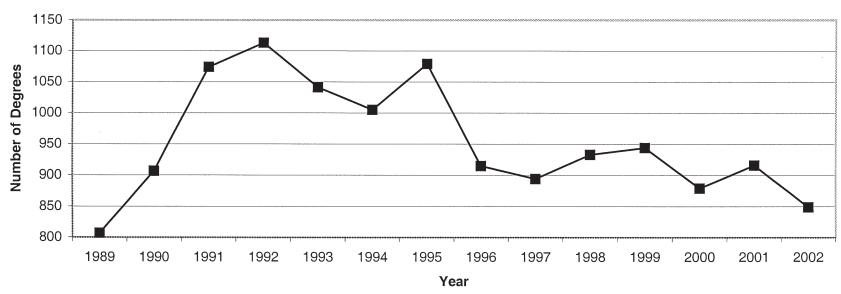

Figure 3. Nonresident Aliens as Fraction of PhD Enrollments

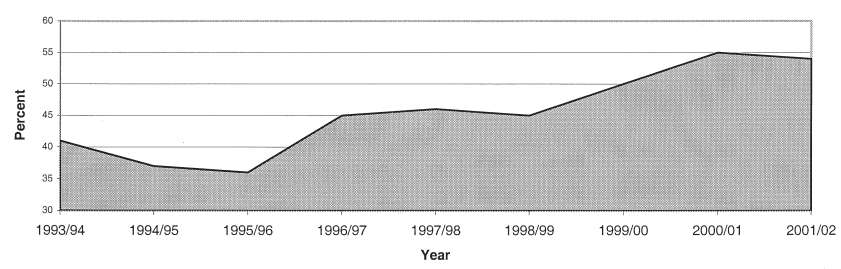

Table 1. Ph.D. Production by Type of Department and Rank

Department, Rank	Ph.D.s Produced	Avg. per Dept.	Ph.D.s Next Year	Avg. per Dept.	Passed Qualifier	Avg. per Dept.	Passed Thesis Exam	Avg. per Dept.
US CS 1-12	197	16.4	213	17.8	267	22.3	153	12.8
US CS 13-24	135	11.3	154	12.8	150	12.05	117	9.8
US CS 25-36	69	6.3	117	10.6	159	14.5	75	6.8
US CS Other	340	3.0	503	4.5	633	5.7	368	3.3
Canadian	72	3.3	110	5.0	111	5.1	57	2.6
US CE	36	3.6	127	12.7	55	5.5	114	11.4
Total	**849**	**4.7**	**1,224**	**6.8**	**1,375**	**7.7**	**884**	**4.9**

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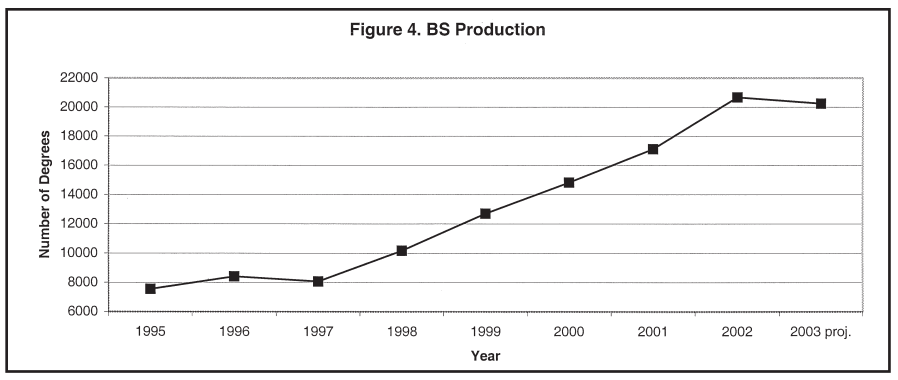
Master's and Bachelor's Degree Production and Enrollments *(Tables 9-16)*

The statistics on Master's and Bachelor's programs show mixed trends. Master's degrees were awarded to 7,918 students, a decrease of 4 percent from last year. Bachelor's degrees numbered 20,677, an increase of 21 percent. This year's Master's production exceeded the projection from last year's survey by 8 percent, while Bachelor's production exceeded projections by 11 percent.

The number of new undergraduates actually dropped slightly from 23,090 to 23,033 (0%) (see Figure 5), in contrast with significant increases in recent years. As yet, we cannot determine whether this was simply an artifact of the changes in the departments reporting, or the start of a new trend. Perhaps the decline in the technology industry is making computer science and engineering less alluring to new undergraduates. In addition, some programs may be operating in "saturation" mode, where they simply cannot accept more undergraduate majors, given their teaching resources. It is quite clear that the period of explosive growth in enrollments in Bachelor's programs is over. Anecdotal evidence suggests that the trend of increasing enrollments is near its peak, and is perhaps headed towards a decline.

In all other numbers, we again see mixed trends in both Bachelor's and Master's programs. New Master's students (Table 13) decreased by 3% percent; total enrollments in Bachelor's programs (Table 16) increased by 11% and enrollments in Master's programs (Table 15) increased by 21%. We seem to be in a period of changing patterns in all degree programs; it may take a while before the new trends are clear.

Most demographics regarding gender and ethnicity for Bachelor's and Master's students show remarkable stability when compared with last year's results. As with Ph.D. recipients (whose numbers actually decreased this year), the proportion of Master's degree recipients who are nonresident aliens decreased slightly, from 57 percent last year to 56 percent this year (Table 10).



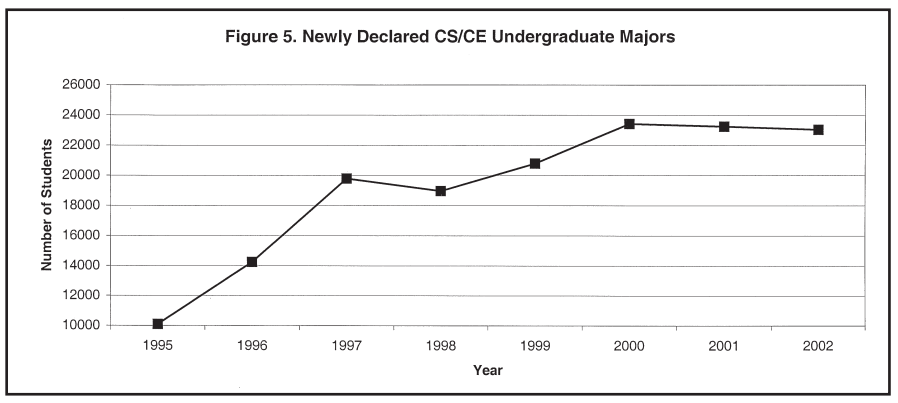


Table 2. Gender of Ph.D. Recipients by Type of Degree

	CS		CE		CS&CE	
Male	610	82.2%	70	84.3%	680	82.4%
Female	132	17.8%	13	15.7%	145	17.6%
Total have Gender Data for	742		83		825	
Unknown	24		0		24	
Total	**766**		**83**		**849**	

Table 3. Ethnicity of Ph.D. Recipients by Type of Degree

	CS		CE		CS&CE	
Nonresident Alien	316	44.8%	54	68.4%	370	47.2%
African-American, Non-Hispanic	9	1.3%	1	1.3%	10	1.3%
Native American/ Alaskan Native	2	0.3%	4	5.1%	6	0.8%
Asian/Pacific Islander	81	11.5%	3	3.8%	84	10.7%
Hispanic	11	1.6%	0	0.0%	11	1.4%
White, Non-Hispanic	275	39.0%	16	20.3%	291	37.1%
Other/Not Listed	11	1.6%	1	1.3%	12	1.5%
Total have Ethnicity Data for	**705**		**79**		**784**	
Ethnicity/Residency Unknown	61		4		65	
Total	**766**		**83**		**849**	

Faculty Demographics *(Tables 17-23)*

Over the past year, the total number of faculty increased by 3 percent to a total of 5,520. This increase was present in all faculty categories (but not for researchers or postdocs). Considering that 229 faculty are reported to have left their current positions in academia (Table 23), the survey indicates 405 new faculty positions this year. Our Ph.D. production shows only 351 graduates taking faculty positions (Table 4.) Some of the new teaching faculty may not have Ph.D. degrees, and some new faculty may have come from nonacademic sources. There is some influx of existing Ph.D.-holders into academia as industrial labs are being downsized and reorganized.

This year's faculty growth to 5,520 was less than the prediction of 5,955 from last year's survey. The planned two-year growth rate of 14 percent is significantly less than last year's

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Table 4. Employment of New Ph.D. Recipients by Specialty

New Ph.D.s in Ph.D.-Granting Depts.	Artificial Intelligence/ Robotics	Hardware/Architecture	Numerical Analysis/ Scientific Computing	Programming Languages/Compilers	OS/Networks	Software Engineering	Theory/Algorithms	Graphics/ Human Interfaces	Databases/ Information Systems	Other/Unknown	Total		
Tenure-track	35	16	7	9	36	9	28	12	23	12	**187**	27.1%	50.8%
Researcher	12	3	3	2	5	2	3	11	2	5	**48**	6.9%	
Postdoc	27	5	4	5	7	5	13	5	5	7	**83**	12.0%	
Teaching Faculty	3	0	1	5	4	3	6	3	2	6	**33**	4.8%	
New Ph.D.s, Other Categories													
Other CS/CE Dept.	1	2	0	1	2	0	1	1	0	1	**9**	1.3%	49.2%
Non-CS/CE Dept.	0	0	0	0	0	2	0	1	0	1	**4**	0.6%	
Industry	39	38	11	17	30	20	18	26	39	26	**264**	38.2%	
Government	7	0	5	0	0	1	0	0	1	4	**18**	2.6%	
Self-Employed	0	0	1	0	1	1	0	0	0	0	**3**	0.4%	
Employed Abroad	3	0	2	1	9	1	2	3	5	5	**31**	4.5%	
Unemployed	2	1	0	0	1	0	2	3	0	2	**11**	1.6%	
Total have Employment Data for	**129**	**65**	**34**	**40**	**95**	**44**	**73**	**65**	**77**	**69**	**691**	**100.0%**	**100.0%**
Unknown	18	6	1	6	2	0	6	9	8	100	**156**		
Total	**147**	**71**	**35**	**46**	**97**	**44**	**79**	**74**	**85**	**169**	**847**		

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Table 5. New Ph.D. Students in Fall 2002 by Department Type and Rank

	CS				CE				CS & CE	
Department, Rank	New Admit	MS to Ph.D.	Total	Avg. per Dept.	New Admit	MS to Ph.D.	Total	Avg. per Dept.	Total	Avg. per Dept.
US CS 1-12	388	89	477	39.8	0	0	0	0	477	39.8
US CS 13-24	304	40	344	28.7	6	0	6	0.5	350	29.2
US CS 25-36	298	34	332	30.2	0	0	0	0	332	30.2
US CS Other	1,157	368	1,525	13.6	94	28	122	1.1	1,647	14.7
Canadian	178	64	242	11.0	11	11	22	1.0	264	12.0
US CE	0	0	0	0	120	96	216	21.6	216	21.6
Total	**2,325**	**595**	**2,920**	**16.3**	**231**	**135**	**366**	**2.0**	**3,286**	**18.4**

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21 percent. The projected target of 5,881 positions for 2003-04 reflects growth of less than 7 percent. Last year we observed that the planned growth targets were unrealistically aggressive, compared with the predicted supply of new Ph.D.s. This year, the combination of increasing supply (because of the increased attractiveness of academia) and decreasing targets makes the recruiting objectives seem more feasible, although the tough economic environment suggests that even 7% growth is perhaps too optimistic.

Table 23 on faculty "losses" shows that a large number took academic positions elsewhere. Only 89 (1.6% of total faculty) actually left academia through death, retirement, or taking nonacademic positions. This compares with 140 (2.6% of total faculty) last year. Overall, the rate of departures over the past few years has remained within the very stable range of between 1.6 percent and 2.6 percent. The faculty "retention problem" that was so much discussed over the past few years seems to have solved itself.

The demographic data for faculty (Tables 19–22) are very similar to those from last year. We see that the gender split of new faculty (82% male, 18% female) is very close to the split for new Ph.D. recipients (Table 2). There is some skew in the distribution, with somewhat more men in tenure-track (83%) and research (89%) positions, and somewhat more women in teaching (26%) and other (60%) positions, but these numbers are actually more balanced than in previous years.

It is interesting to compare the ethnicity data for new faculty (Table 20) with that of Ph.D. recipients (Table 3). Fully 55 percent of the new faculty are white, non-Hispanic, even though only 37 percent of the Ph.D. recipients are in this category. By contrast, only 23 percent of the new faculty are nonresident aliens, whereas fully 47 percent of the degree recipients are in that category. Some new faculty could have become residents after receiving their Ph.D. degrees, but it seems clear that proportionately fewer foreign students take positions at U.S. universities.

Table 6. Ph.D. Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1,824	20.5%	0	0.0%	1,824	18.2%
US CS 13-24	1,380	15.5%	9	0.8%	1,389	13.9%
US CS 25-36	1,086	12.2%	0	0.0%	1,086	10.8%
US CS Other	3,929	44.2%	314	27.7%	4,243	42.3%
Canadian	667	7.5%	51	4.5%	718	7.2%
US CE	1	0.0%	760	67.0%	761	7.6%
Total	**8,887**		**1,134**		**10,021**	

Table 7. Ph.D. Program Total Enrollment by Gender

	CS		CE		CS & CE	
Male	7,019	80.5%	970	85.6%	7,989	81.1%
Female	1,701	19.5%	163	14.4%	1,864	18.9%
Total have Gender Data for	**8,720**		**1,133**		**9,853**	
Unknown	167		1		168	
Total	**8,887**		**1,134**		**10,021**	

Table 8. Ph.D. Program Total Enrollment by Ethnicity

	CS		CE		CS&CE	
Nonresident Alien	4,217	53.6%	721	67.2%	4,938	55.2%
African-American, Non-Hispanic	124	1.6%	29	2.7%	153	1.7%
Native American/ Alaskan Native	13	0.2%	1	0.1%	14	0.2%
Asian/Pacific Islander	750	9.5%	63	5.9%	813	9.1%
Hispanic	99	1.3%	9	0.8%	108	1.2%
White, Non-Hispanic	2,568	32.6%	224	20.9%	2,792	31.2%
Other/Not Listed	103	1.3%	26	2.4%	129	1.4%
Total have Ethnicity Data for	**7,874**		**1,073**		**8,947**	
Ethnicity/Residency Unknown	1,013		61		1,074	
Total	**8,887**		**1,134**		**10,021**	

Research Expenditures and Graduate Student Support *(Tables 24-26)*

The first question asked: "For the most recently completed fiscal year, what was the department's total expenditure (including indirect costs or "overhead" as stated on project budgets) from external sources of support for Computer Science/ Engineering research?" The results are reported in Table 24, showing both absolute and per-capita numbers, where capitation is computed relative to the number of tenured and tenure-track faculty members. Canadian levels are shown in Canadian dollars. The data show a clear correlation between ranking and per-capita expenditures, although this correlation holds only between ranking bands (1-12, 13-24, etc.) and per-capita expenditures. As expected, Canadian departments show a lower level of expenditures from external sources, stemming, no doubt, from the different way that research is funded in Canada. Computer engineering departments also show a lower level of expenditures from external sources, but no conclusion can be drawn due to the low response rate of computer engineering departments.

The second question asked departments to "provide the number of graduate students supported as full-time students as of fall 2002," further categorized as teaching assistants, research assistants, fellows, or computer systems' supporters, and split between those on institutional vs. external funds. The results are shown in Table 25. Overall, we can see that the higher-ranked schools are able to support more students with research positions through research assistantships and fellowships, while the other schools rely more on teaching assistantships to support their students. Canadian schools also have a high proportion (52%) of students supported via teaching assistantships. The number supported for computer systems support is very small.

The third question asked respondents to "provide the net amount (as of fall 2002) of an academic-year stipend for a graduate student (not including tuition or fees)." The results are shown in Table 26. Canadian stipends are shown in Canadian dollars. The numbers suggest a gap between departments in the top two ranking bands and departments in lower bands in all categories of graduate-student support.

Faculty Salaries *(Tables 27-34)*

U.S. average salaries increased by just over 3 percent for different categories, less than last year's increases (average salaries for non-teaching faculty actually declined slightly). Canadian salaries (shown as 12-month salaries in Canadian dollars) increased by 3.8% to 5.2% for different categories, less than for last year (again with a slight decrease for non-teaching faculty).

Concluding Observations

Overall, signs indicate a continued growth in graduate (both Master's and Ph.D.) programs in computer science and engineering. Although Ph.D. output declined slightly this year, it appears there will be a significant increase over the next few years. The growth at the Bachelor's level has diminished compared with recent years, with even a slight decrease in the number of newly declared majors. It is still too early to tell whether this is the start of a trend toward declining undergraduate enrollments (as has happened at other times during downturns in the technology

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Table 9. Gender of Bachelor's and Master's Recipients

	Bachelor's						Master's					
	CS		CE		CS & CE		CS		CE		CS & CE	
Male	12,497	81.2%	3,201	88.0%	15,698	82.5%	4,696	74.1%	732	82.6%	5,428	75.1%
Female	2,891	18.8%	435	12.0%	3,326	17.5%	1,643	25.9%	154	17.4%	1,797	24.9%
Total have Gender Data for	**15,388**		**3,636**		**19,024**		**6,339**		**886**		**7,225**	
Unknown	1,519		134		1,653		692		1		693	
Total	**16,907**		**3,770**		**20,677**		**7,031**		**887**		**7,918**	

Table 10. Ethnicity of Bachelor's and Master's Recipients

	Bachelor's						Master's					
	CS		CE		CS & CE		CS		CE		CS & CE	
Nonresident Alien	921	8.5%	216	8.4%	1,137	8.5%	3,218	55.7%	476	60.8%	3,694	56.3%
African-American, Non-Hispanic	368	3.4%	115	4.5%	483	3.6%	65	1.1%	18	2.3%	83	1.3%
Native American/Alaskan Native	44	0.4%	6	0.2%	50	0.4%	9	0.2%	0	0.0%	9	0.1%
Asian/Pacific Islander	2,346	21.7%	437	17.1%	2,783	20.1%	909	15.7%	49	6.3%	958	14.6%
Hispanic	390	3.6%	90	3.5%	480	3.6%	68	1.2%	9	1.1%	77	1.2%
White, Non-Hispanic	6,261	57.8%	1,484	57.9%	7,745	57.8%	1,420	24.5%	230	29.4%	1,650	25.1%
Other/Not Listed	506	4.7%	213	8.3%	719	5.4%	93	1.6%	1	0.1%	94	1.4%
Total have Ethnicity Data for	**10,836**		**2,561**		**13,397**		**5,782**		**783**		**6,565**	
Ethnicity/Residency Unknown	6,071		1,209		7,280		1,249		104		1,353	
Total	**16,907**		**3,770**		**20,677**		**7,031**		**887**		**7,918**	

Table 11. Bachelor's Degree Candidates for 2002-2003 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	2,093	12.4%	233	6.9%	2,326	11.5%
US CS 13-24	1,515	9.0%	466	13.8%	1,981	9.8%
US CS 25-36	1,623	9.6%	73	2.2%	1,696	8.4%
US CS Other	8,186	48.5%	1,580	46.6%	9,766	48.2%
Canadian	3,445	20.4%	277	8.2%	3,722	18.4%
US CE	0	0.0%	758	22.4%	758	3.7%
Total	**16,862**		**3,387**		**20,249**	

Table 12. Master's Degree Candidates for 2002-2003 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	809	11.8%	65	6.7%	874	11.2%
US CS 13-24	688	10.1%	0	0.0%	688	8.8%
US CS 25-36	479	7.0%	0	0.0%	479	6.1%
US CS Other	4,335	63.3%	405	41.8%	4,740	60.7%
Canadian	534	7.8%	76	7.8%	610	7.8%
US CE	0	0.0%	423	43.7%	423	5.4%
Total	**6,845**		**969**		**7,814**	

Table 13. New Master's Students in Fall 2002 by Department Type and Rank

	CS		CE		CS & CE	
Department, Rank	Total	Avg. per Dept.	Total	Avg. per Dept.	Total	Avg. per Dept.
US CS 1-12	539	49.0	60	5.5	599	54.5
US CS 13-24	749	62.4	2	0.2	751	62.6
US CS 25-36	330	30.0	0	0.0	330	30.0
US CS Other	4,348	38.5	342	3.0	4,690	41.5
Canadian	832	37.8	44	2.0	876	39.8
US CE	0	0.0	283	28.3	283	28.3
Total	**6,798**	**38.0**	**731**	**4.1**	**7,529**	**42.1**

Table 14. New Undergraduate Students in Fall 2002 by Department Type and Rank

	CS			CE			CS & CE Majors	
Department, Rank	Pre-Major	Major	Average Major per Dept.	Pre-Major	Major	Average Major per Dept.	Major	Average Major per Dept.
US CS 1-12	720	940	85.5	0	206	18.7	1,146	104.2
US CS 13-24	192	1,100	91.7	0	446	37.2	1,546	128.8
US CS 25-36	408	2,595	216.3	0	0	0.0	2,595	216.3
US CS Other	3,637	9,348	83.5	795	2,219	19.8	11,567	103.3
Canadian	1,536	5,089	231.3	0	378	17.2	5,467	248.5
US CE	0	0	0.0	302	712	71.2	712	71.2
Total	**6,493**	**19,072**	**106.6**	**1,097**	**3,961**	**22.1**	**23,033**	**128.7**

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economy), whether it simply indicates that many programs are operating at full capacity and cannot expand further, or whether it is just an artifact of the shifting departments responding to our survey. We suspect, however, that this is the start of a trend toward declining enrollments.

Rankings

For tables that group computer science departments by rank, the rankings are based on information collected in the 1995 assessment of research and doctorate programs in the United States conducted by the National Research Council.

The top twelve schools in this ranking are: Stanford, Massachusetts Institute of Technology, University of California (Berkeley), Carnegie Mellon, Cornell, Princeton, University of Texas (Austin), University of Illinois (Urbana-Champaign), University of Washington, University of Wisconsin (Madison), Harvard, and California Institute of Technology. All schools in this ranking participated in the survey this year.

CS departments ranked 13-24 are: Brown, Yale, University of California (Los Angeles), University of Maryland (College Park), New York University, University of Massachusetts (Amherst), Rice, University of Southern California, University of Michigan, University of California (San Diego), Columbia, and University of Pennsylvania.[2] All schools in this ranking participated in the survey this year.

CS departments ranked 25-36 are: University of Chicago, Purdue, Rutgers, Duke, University of North Carolina (Chapel Hill), University of Rochester, State University of New York (Stony Brook), Georgia Institute of Technology, University of Arizona, University of California (Irvine), University of Virginia, and Indiana. All schools in this ranking participated in the survey this year.

CS departments that are ranked above 36 or that are unranked that responded to the survey include: Arizona State University, Auburn, Boston, Brandeis, Case Western Reserve, Clemson, College of William and Mary, Colorado School of Mines, Colorado State, Dartmouth, DePaul, Drexel, Florida Institute of Technology, Florida International, Florida State, George Mason, George Washington, Georgia State, Illinois Institute of Technology, Iowa State, Johns Hopkins, Kansas State, Kent State, Lehigh, Louisiana State, Michigan State, Michigan Technological, Mississippi State, Montana State, New Jersey Institute of Technology, New Mexico State, North Carolina State, North Dakota State, Northeastern, Northwestern, Oakland, Ohio State, Oklahoma State, Old Dominion, Oregon Health & Science, Oregon State, Pennsylvania State, Polytechnic, Portland State, Rensselaer Polytechnic, Southern Methodist, State University of New York (Albany and Buffalo), Stevens Institute, Syracuse, Texas A&M, Texas Tech, Tufts, Utah State, Vanderbilt, Virginia Commonwealth, Virginia Polytechnic, Washington State, Washington (St. Louis), Wayne State, West Virginia, Western Michigan, Worcester Polytechnic, and Wright State.

University of: Alabama (Birmingham, Huntsville, and Tuscaloosa), Arkansas, California (at Davis, Riverside, Santa Barbara, and Santa Cruz), Central Florida, Cincinnati, Colorado (at Boulder, Colorado Springs, and Denver), Connecticut, Delaware, Denver, Florida, Georgia, Hawaii, Illinois (Chicago), Iowa, Kansas, Kentucky, Louisiana (Lafayette), Maine, Maryland (Baltimore Co.), Massachusetts (at Boston and Lowell), Minnesota, Missouri (at Rolla and Columbia), Nebraska (Lincoln), Nevada (Las Vegas), New Mexico, North Texas, Notre Dame, Oklahoma, Oregon, Pittsburgh, South Carolina, South Florida, Tennessee (Knoxville),

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Table 15. Master's Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1,323	6.6%	65	3.0%	1,388	6.2%
US CS 13-24	1,654	8.2%	4	0.2%	1,658	7.4%
US CS 25-36	781	3.9%	0	0.0%	781	3.5%
US CS Other	14,583	72.2%	1,083	50.3%	15,666	70.1%
Canadian	1,856	9.2%	279	13.0%	2,135	9.6%
US CE	0	0.0%	721	33.5%	721	3.2%
Total	**20,197**		**2,152**		**22,349**	

Table 16. Bachelor's Degree Program Total Enrollment by Department Type and Rank

Department, Rank	CS			CE			CS & CE Majors	
	Pre-Major	Major	Average Major per Dept.	Pre-Major	Major	Average Major per Dept.	Total	Average Major per Dept.
US CS 1-12	644	5,860	532.7	0	634	57.6	6,494	590.4
US CS 13-24	191	4,636	386.3	0	1,756	146.3	6,392	532.7
US CS 25-36	1,510	6,618	551.5	0	0	0.0	6,618	551.5
US CS Other	8,422	40,423	360.9	1,551	7,730	69.0	48,153	429.9
Canadian	4,067	21,566	980.3	0	1,886	85.7	23,452	1,066.0
US CE	0	0	0	697	3,352	335.2	3,352	335.2
Total	**14,834**	**79,103**	**441.9**	**2,248**	**15,358**	**85.8**	**94,461**	**527.7**

Table 17. Actual and Anticipated Faculty Size by Position

	Actual	Projected		Expected Two-Year Growth	
	2002-2003	2003-2004	2004-2005		
Tenure-Track	4,047	4,337	4,618	571	14.1%
Researcher	374	415	459	85	22.7%
Postdoc	278	302	351	73	26.3%
Teaching Faculty	708	708	737	29	4.1%
Other/Not Listed	113	119	125	12	10.6%
Total	**5,520**	**5,881**	**6,290**	**770**	**13.9%**

Table 18. Actual and Anticipated Faculty Size by Department Type and Rank

	Actual	Projected		Expected Two-Year Growth	
	2002-2003	2003-2004	2004-2005		
US CS 1-12	692	732	781	89	12.9%
US CS 13-24	494	537	570	76	15.4%
US CS 25-36	480	530	580	100	20.8%
US CS Other	2,807	2,985	3,194	387	13.8%
Canadian	883	953	1,011	128	14.5%
US CE	164	144	154	-10	-6.1%
Total	**5,520**	**5,881**	**6,290**	**770**	**13.9%**

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Table 19. Gender of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching		Other		Total	
Male	331	82.8%	74	89.2%	86	84.3%	84	74.3%	2	40.0%	577	82.1%
Female	69	17.3%	9	10.8%	16	15.7%	29	25.7%	3	60.0%	126	17.9%
Total	**400**	**56.9%**	**83**	**11.8%**	**102**	**14.5%**	**113**	**16.1%**	**5**	**0.7%**	**703**	
Unknown	0		0		0		0		0		0	

Table 20. Ethnicity of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching Faculty		Other		Total	
Nonresident Alien	79	21.7%	15	20.8%	42	43.3%	10	10.0%	0	0.0%	146	22.9%
African-American, Non-Hispanic	4	1.1%	0	0.0%	1	1.0%	2	2.0%	0	0.0%	7	1.1%
Native American/Alaskan Native	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Asian/Pacific Islander	61	16.8%	10	13.9%	24	24.7%	10	10.0%	1	20.0%	106	16.6%
Hispanic	4	1.1%	3	4.2%	1	1.0%	3	3.0%	0	0.0%	11	1.7%
White, Non-Hispanic	204	56.0%	44	61.1%	29	29.9%	71	71.0%	4	80.0%	352	55.2%
Other/Not Listed	12	3.3%	0	0.0%	0	0.0%	4	4.0%	0	0.0%	16	2.5%
Total have Ethnicity Data for	**364**		**72**		**97**		**100**		**5**		**638**	
Ethnicity/Residency Unknown	36		11		5		13		0		65	
Total	**400**		**83**		**102**		**113**		**5**		**703**	

Table 21. Gender of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Total	
Male	1,630	92.2%	1,029	86.9%	1,054	84.6%	579	73.8%	4,292	86.2%
Female	137	7.8%	155	13.1%	192	15.4%	206	26.2%	690	13.8%
Total have Gender Data for	**1,767**	**35.5%**	**1,184**	**23.8%**	**1,246**	**25.0%**	**785**	**15.8%**	**4,982**	

Table 22. Ethnicity of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Total	
Nonresident Alien	7	0.4%	22	2.0%	214	19.2%	32	4.2%	275	6.0%
African-American, Non-Hispanic	4	0.2%	8	0.7%	16	1.4%	18	2.4%	46	1.0%
Native American/Alaskan Native	6	0.4%	2	0.2%	3	0.3%	3	0.4%	14	0.3%
Asian/Pacific Islander	287	17.9%	231	20.9%	191	17.2%	49	6.5%	758	16.6%
Hispanic	18	1.1%	18	1.6%	24	2.2%	16	2.1%	76	1.7%
White, Non-Hispanic	1,242	77.4%	784	71.1%	645	58.0%	626	83.0%	3,297	72.1%
Other/Not Listed	41	2.6%	38	3.4%	20	1.8%	10	1.3%	109	2.4%
Total have Ethnicity Data for	**1,605**		**1,103**		**1,113**		**754**		**4,575**	
Ethnicity/Residency Unknown	162		81		133		31		407	
Total	**1,767**		**1,184**		**1,246**		**785**		**4,982**	

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Texas (at Arlington, Dallas, El Paso, and San Antonio), Tulsa, Utah, and Wyoming.

Computer Engineering departments participating in the survey this year include: Cornell, Georgia Institute of Technology, Johns Hopkins, North Carolina State, Northwestern, Oregon State, Purdue, Rensselaer Polytechnic, University of California (Santa Cruz), University of Illinois (Urbana-Champaign), and the University of New Mexico.

Canadian departments participating in the survey include: Carleton, Dalhousie, McGill, Memorial, Queen's, Simon Fraser, and York universities. **University of:** Alberta, British Columbia, Calgary, Laval, Manitoba, Montreal, New Brunswick, Quebec (Montreal), Regina, Saskatchewan, Toronto (CS and ECE), Victoria, Waterloo, and Western Ontario.

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Jean Smith and Drew Sutter assisted with data collection, tabulation, and analysis for this survey. We thank them for their assistance. Randy Bryant and Stu Zweben participated in the discussion of the analysis, and provided useful suggestions for this document.

Endnotes

[1]The title of the survey honors the late Orrin E. Taulbee of the University of Pittsburgh, who conducted these surveys for the Computer Science Board until 1984, with retrospective annual data going back to 1970.

[2]Although the University of Pennsylvania and the University of Chicago were tied in the National Research Council rankings, CRA made the arbitrary decision to place Pennsylvania in the second tier of schools.

Table 23. Faculty Losses

	Total
Died	4
Retired	59
Took Academic Position Elsewhere	108
Took Nonacademic Position	26
Remained, but Changed to Part-Time	11
Other	18
Unknown	3
Total	**229**

All tables with rankings: Statistics sometimes are given according to departmental rank. Schools are ranked only if they offer a CS degree and according to the quality of their CS program as determined by reputation. Those that only offer CE degrees are not ranked, and statistics are given on a separate line, apart from the rankings.

All ethnicity tables: Ethnic breakdowns are drawn from guidelines set forth by the U.S. Department of Education.

All faculty tables: The survey makes no distinction between faculty specializing in CS vs. CE programs. Every effort is made to minimize the inclusion of faculty in electrical engineering who are not computer engineers. ■

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Table 24. Total Expenditure from External Sources for CS/CE Research by Department Rank and Type

Department, Rank	Total Expenditure Minimum	Average	Median	Maximum	Per Capita Expenditure Minimum	Average	Median	Maximum
US CS 1-12	$1,450,000	$16,950,260	$9,904,050	$61,902,887	$87,879	$376,583	$307,130	$952,352
US CS 13-24	$4,686,549	$8,661,334	$7,500,000	$14,543,024	$144,168	$323,123	$279,252	$618,853
US CS 25-36	$545,118	$4,778,106	$5,000,000	$12,324,811	$29,307	$173,590	$170,549	$318,308
US CS Other	$125,000	$2,065,788	$1,368,755	$14,319,441	$12,454	$108,516	$90,129	$572,778
Canadian	$171,445	$1,958,063	$1,267,918	$8,659,771	$8,572	$54,278	$36,781	$199,075
US CE	$155,595	$2,308,094	$1,000,000	$9,007,293	$33,687	$114,863	$108,475	$281,478

Table 25. Graduate Students Supported as Full-Time Students by Department Type and Rank

Department/ Rank	Number on Institutional Funds: Teaching Assistants	Research Assistants	Full-Support Fellows	Graduate Assistants for Computer Systems Support	Other	Number on External Funds: Teaching Assistants	Research Assistants	Full-Support Fellows	Graduate Assistants for Computer Systems Support	Other
US CS 1-12	377 22.0%	243 14.0%	115 6.6%	0 0.0%	1 0.1%	0 0.0%	807 46.5%	175 10.1%	0 0.0%	17 1.0%
US CS 13-24	331 20.3%	24 1.5%	66 4.1%	1 0.1%	0 0.0%	0 0.0%	1,012 62.2%	194 12.0%	0 0.0%	0 0.0%
US CS 25-36	418 33.8%	160 13.0%	48 3.9%	0 0.0%	5 0.4%	8 0.6%	540 43.7%	49 4.0%	0 0.0%	7 0.6%
US CS Other	1,900 40.8%	388 8.3%	147 3.2%	87 1.9%	38 0.8%	6 0.1%	1,887 40.5%	177 3.8%	1 0.0%	23 0.5%
Canadian	354 37.0%	188 19.6%	21 2.2%	0 0.0%	10 1.0%	29 3.0%	225 23.5%	121 12.6%	0 0.0%	10 1.0%
US CE	198 21.9%	106 11.7%	20 2.2%	10 1.1%	1 0.1%	0 0.0%	559 61.8%	11 1.2%	0 0.0%	0 0.0%
Total	**3,578 32.2%**	**1,109 10.0%**	**417 3.8%**	**98 0.9%**	**55 0.5%**	**43 0.4%**	**5,030 45.3%**	**727 6.5%**	**1 0.0%**	**57 0.5%**

Table 26-1. Fall 2002 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Total Assistantships Minimum	Mean	Median	Maximum	Research Assistantships Minimum	Mean	Median	Maximum
US CS 1-12	$9,587	$15,378	$16,268	$18,276	$13,419	$16,905	$17,005	$19,632
US CS 13-24	$3,490	$14,247	$14,522	$19,000	$8,736	$15,969	$15,639	$20,808
US CS 25-36	$11,260	$13,787	$13,701	$15,510	$12,336	$14,197	$14,079	$15,510
US CS Other	$3,000	$12,543	$12,500	$20,800	$3,000	$13,286	$12,833	$20,800
Canadian	$1,305	$9,564	$10,000	$18,000	$4,000	$12,434	$13,000	$19,700
US CE	$1,519	$12,820	$13,559	$19,464	$1,409	$12,100	$13,606	$19,464

Table 26-2. Fall 2002 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Full-Support Fellows Minimum	Mean	Median	Maximum	Assistantships for Computer Systems Support Minimum	Mean	Median	Maximum
US CS 1-12	$16,812	$18,132	$18,000	$20,000	*	*	*	*
US CS 13-24	$12,000	$17,747	$16,518	$28,500	*	*	*	*
US CS 25-36	$12,000	$15,206	$15,459	$19,000	*	*	*	*
US CS Other	$4,200	$15,521	$15,200	$25,000	$7,500	$11,984	$12,150	$18,000
Canadian	$15,000	$19,504	$18,850	$25,000	*	*	*	*
US CE	$1,625	$13,826	$15,000	$19,464	*	*	*	*

*Numbers not reported due to low number of respondents

Table 26-3. Fall 2002 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Minimum	Mean	Median	Maximum
US CS 1-12	*	*	*	*
US CS 13-24	*	*	*	*
US CS 25-36	*	*	*	*
US CS Other	$3,450	$11,401	$11,939	$15,832
Canadian	$2,250	$10,270	$5,100	$30,000
US CE	*	*	*	*

*Numbers not reported due to low number of respondents

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Table 27. Nine-month Salaries, 146 Responses of 170 US CS Computer Science Departments

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	629	$20,000	$47,023	$81,840	$55,044	$54,269	$24,000	$64,192	$132,400
Assistant Professor	953	$46,800	$70,764	$90,500	$75,114	$75,138	$61,308	$79,402	$120,000
Associate Professor	920	$53,772	$75,497	$110,000	$83,502	$83,051	$63,648	$92,468	$175,000
Full Professor	1,340	$39,873	$86,960	$146,000	$109,030	$105,294	$80,760	$142,408	$280,786

Table 28. Nine-month Salaries, 11 Responses of 12 US CS Computer Science Departments Ranked 1-12

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	75	$37,296	$53,956	$76,136	$71,672	$71,719	$66,150	$88,114	$110,000
Assistant Professor	118	$50,000	$74,711	$82,000	$80,891	$81,357	$83,200	$86,483	$96,000
Associate Professor	86	$62,995	$84,148	$103,000	$91,412	$90,847	$79,300	$97,949	$120,000
Full Professor	218	$51,600	$88,632	$109,800	$122,732	$116,825	$139,518	$168,860	$198,646

Table 29. Nine-month Salaries, 12 Responses of 12 US CS Computer Science Departments Ranked 13-24

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	56	$46,542	$60,096	$81,840	$69,208	$66,993	$62,200	$80,631	$100,000
Assistant Professor	94	$74,000	$78,070	$82,000	$83,673	$82,239	$82,500	$90,538	$117,000
Associate Professor	64	$67,915	$85,663	$97,520	$92,985	$92,069	$85,900	$98,827	$127,000
Full Professor	200	$76,596	$93,962	$111,300	$127,845	$121,462	$153,422	$185,306	$280,786

Table 30. Nine-month Salaries, 12 Responses of 12 US CS Computer Science Departments Ranked 25-36

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	51	$39,634	$53,998	$75,408	$62,620	$61,198	$59,223	$75,352	$132,400
Assistant Professor	100	$46,800	$71,228	$80,000	$77,535	$77,485	$73,380	$82,390	$88,134
Associate Professor	96	$63,907	$78,592	$92,277	$89,354	$89,588	$87,100	$99,811	$120,000
Full Professor	153	$68,199	$89,345	$109,000	$115,998	$114,630	$110,650	$160,350	$195,550

Table 31. Nine-month Salaries, 111 Responses of 134 US CS Computer Science Departments Ranked Higher than 36 or Unranked

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	448	$20,000	$44,182	$81,500	$51,100	$50,474	$24,000	$58,903	$109,000
Assistant Professor	641	$48,269	$69,521	$90,500	$73,338	$73,486	$61,308	$77,153	$120,000
Associate Professor	674	$53,772	$73,284	$110,000	$81,131	$80,667	$63,648	$90,493	$175,000
Full Professor	769	$39,873	$85,747	$146,000	$104,770	$101,286	$80,760	$132,954	$275,000

Table 32. Nine-month Salaries, 8 Responses of 29 US Computer Engineering Departments

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	17	$44,112	$59,798	$89,611	$66,766	$66,425	$54,468	$73,027	$89,611
Assistant Professor	57	$55,000	$70,110	$80,020	$75,165	$73,805	$70,002	$79,455	$94,500
Associate Professor	39	$69,000	$77,036	$87,000	$84,283	$81,446	$69,786	$91,021	$110,000
Full Professor	87	$76,398	$87,501	$95,000	$114,659	$102,720	$80,220	$148,338	$200,000

Table 33. Twelve-month Salaries, 21 Responses of 27 Canadian Computer Science Departments (Canadian Dollars)

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	80	$38,411	$56,510	$94,000	$63,252	$62,360	$47,283	$72,363	$100,000
Assistant Professor	219	$43,582	$70,619	$95,119	$78,268	$77,823	$59,568	$86,788	$127,000
Associate Professor	195	$62,298	$81,692	$111,000	$90,450	$89,799	$62,947	$101,079	$153,000
Full Professor	291	$71,853	$93,314	$111,912	$110,505	$109,668	$94,000	$136,275	$188,133

Table 34. Nine-month Salaries for New Ph.D.s, Responding US CS and CE Departments

Position	Number of People	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track Faculty	163	$58,055	$75,902	$102,000	$76,595	$76,453	$58,055	$77,225	$105,000
Researcher	5	$42,000	$61,750	$72,000	$63,250	$63,250	$42,000	$64,750	$75,000
Postdoc	40	$26,000	$47,360	$60,000	$50,663	$51,201	$40,512	$53,083	$65,000
Non-Tenure Teaching Faculty	12	$36,000	$55,297	$70,772	$55,297	$55,297	$36,000	$55,297	$70,772