

1999-2000 Taulbee Survey

Current and Future Ph.D. Output Will Not Satisfy Demand for Faculty

By Randal E. Bryant and Mary Jane Irwin

This article and the accompanying tables present the results of the 30th CRA Taulbee Survey¹ 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 (1999-2000). Data for new students in all categories and total enrollments for Master's and Bachelor's degrees refer to the current academic year (2000-2001).

Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2001. Responses received by January 14, 2001 are included in the tables.

The survey results represent input from Ph.D.-granting departments only. A total of 214 departments were surveyed, compared with 203 departments last year. Overall, the response rate was 81% (173 departments), a slight improvement over the past several years (Figure 1). The return rate of 6 out of 28 (21%) for CE programs is once again very low. 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 rates for US CS programs (148 of 163, or 91%), and for Canadian programs (19 of 23, or 83%) were very good.

We thank all respondents who completed this year's questionnaire. Departments that participated are

CORRECTION: In the January 2001 edition of CRN, p. 5, the headings in Table 7 for the Taulbee Survey were incorrect. The correct headings under "Faculty Rank" are: (1) Non-Tenure Teaching Faculty; (2) Assistant; (3) Associate; and (4) Full.

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%)

listed at the end of this article. Due to the low return rate for CE, we caution against drawing strong conclusions from the presented data for CE. In our discussion, we will focus on the combined numbers for CS and CE. Since a net of 17 more departments reported this year than last, some of our statistics should be expected to rise.

This article presents the most significant results of the survey, with particular attention to those that differ markedly from last year or that appear to indicate long-term trends. The continued low response rate for CE departments (21% for the last two years) makes trend analysis for CE risky. Overall, the set of schools that responded this year was very similar to last with some additions. For more details on how the faculty salary information is to be interpreted, see the article in the January 2001, CRN on Preliminary Taulbee Faculty Salary Data (<http://www.cra.org/CRN/issues/0101.pdf>). [Note that in the printed version of this January CRN article the labels in the left-hand column of Table 7 were incorrect. These have been corrected in the online version of the January 2001 article and in Table 30 of this current article.]

The survey form itself is modified slightly each year to ensure as high a rate of return as possible (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. This year the only changes were minor rewordings of some questions.

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

As shown in Table 1, a total of 881 Ph.D. degrees were awarded in 2000 by the 173 responding departments. As Figure 2 indicates, this is

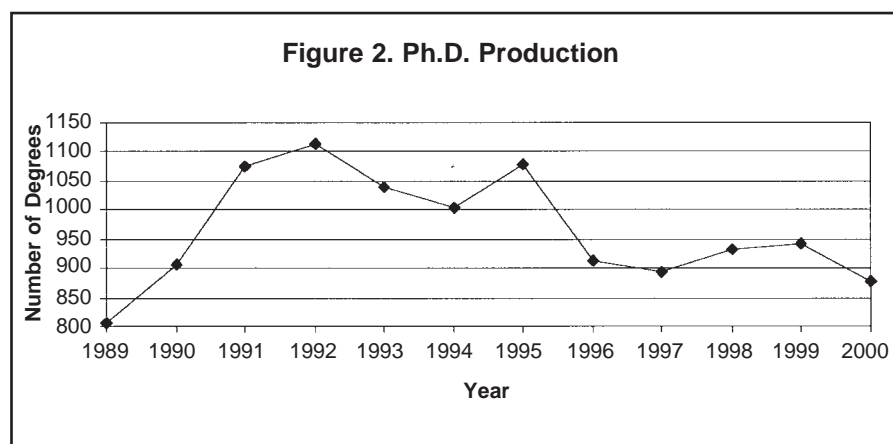
the lowest number in more than 10 years, and it reverses the trend of moderate increases for the past several years.

The prediction from last year's survey that 1,167 Ph.D. degrees would be awarded in 2000 was, as usual, overly optimistic. In fact, it was more optimistic than usual. Last year there were 944 degrees awarded compared with the prediction from the prior year of 1,128, a ratio of 0.84, whereas this year's ratio is 0.75. This range of "optimism ratios" means we would expect the number of degrees next year to be somewhere between 860 and 965, based on the estimate for next year of 1,142.

As we will see later, this decrease is somewhat alarming when considered in light of the high demand for undergraduate and masters education indicated in the survey, as well as the faculty recruiting plans of the schools that will provide these programs.

increase—Table 1); and the total Ph.D. enrollments (Table 6) increased from 7,160 to 7,857 (10% increase). These statistics indicate an improving long-term supply, which is consistent with the study done by Zweben (CRN, September 1999) showing that one must look beyond the annual production of Ph.D. degrees to determine long-term Ph.D. trends. Still, we can see that the production of new Ph.D. degrees will, at best, increase only slightly over the next several years.

Table 4 shows area of specialization versus types of first appointments for Ph.D. recipients in 2000. These statistics are also very similar to those from last year. The only significant change is the increase in the number of recipients in the area of OS/networking (from 107 to 141), with most of the increased supply going to industry, but some to university research positions. In light of the



The Ph.D. production picture is not as gloomy if we consider the other statistics for Ph.D. programs. All other trends for future Ph.D. production show increases. The number who entered Ph.D. programs (Table 5) increased from 1,890 to 2,062 (9% increase); the number who passed qualifiers increased from 930 to 1,119 (20% increase—Table 1); the number who passed their thesis proposal exams increased from 770 to 788 (2%

number of new Ph.D.s in both years' surveys whose areas and/or employment is "unknown," we caution against drawing any strong conclusions.

Most statistics on gender and ethnicity for Ph.D. students (Tables 2, 3, 7, and 8) show remarkably little change from last year. White and nonresident-alien men continue to account for a very large fraction of

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

Department, Rank	Ph.D.s Produced	Ave. per Dept.	Ph.D.s Next Year	Ave. per Dept.	Passed Qualifier	Ave. per Dept.	Passed Thesis Exam	Ave. per Dept.
US CS 1-12	177	16.1	240	21.8	185	16.8	157	14.3
US CS 13-24	124	10.3	147	12.3	148	12.3	124	10.3
US CS 25-36	82	6.8	129	10.8	137	11.4	87	7.3
US CS Other	405	3.6	532	4.7	567	5.1	340	3.0
Canadian	79	4.2	76	4.0	59	3.1	53	2.8
US CE	14	2.3	20	3.3	23	3.8	27	4.5
Total	881	5.1	1,144	6.6	1,119	6.5	788	4.6

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Ph.D. production and enrollments. Women constitute a significant minority (18% of enrollments, 15% of graduates.) All other underrepresented groups are very small minorities. As Figure 3 illustrates, one important threshold was reached for the first time this year—fully 50% of the enrolled Ph.D. students are non-resident aliens. This increase has come with a corresponding decrease in the percentage who are “White, non-Hispanic.” Of course, many other fields of engineering have long passed the 50% mark for foreign students, and so we see no cause for alarm.

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

All statistics on Master's and Bachelor's programs show major growth. A total of 6,562 students received Master's degrees, an increase of 18%. The number of Bachelor's degrees increased to 14,822, an increase of 17%. As Figure 4 indicates, the number of students graduating with Bachelor's degrees has been increasing by approximately 2,100 each year for the past 4 years. This year's Master's production exceeded the projection from last year's survey by 14%, while Bachelor's production exceeded projections by

9%. If this trend continues, then next year's projected production of 15,988 Bachelor's degrees (Table 11) and 6,300 Master's degrees (Table 12) may be too low.

Large increases can be seen in the number of new undergraduate (11% increase) and Master's (19% increase) students, and in the enrollments in Bachelor's (17% increase) and Master's (21% increase) programs. Figure 5 shows that new undergraduate enrollments continue to reach historic highs. Some of these apparent increases may be caused by the increased number of departments responding to our survey, but even normalized statistics, such as the average number of new undergraduate majors per department, grew by 11%.

One interesting feature is that most of the increased enrollments in the United States have occurred in departments ranked above 36. In fact, the number of new undergraduate enrollments in departments ranked 1 through 24 actually declined slightly, while those ranked 25 and above had substantial growth. Schools classified as “US CS Other” now have 59% of the undergraduate students (up from 51% last year), and 71% of the Master's students (up from 66% last year.) For new enrollments, they account for 56% of the undergraduate students (up from 53%) and 65% of the Master's students (up from 57%). Apparently the “big name” schools have not been scaling up to handle the influx of students wishing to pursue computer science and

engineering.

Most demographics regarding gender and ethnicity for Bachelor's and Master's students show remarkable stability when compared with last year's results. The only significant change is that the fraction of Master's degree recipients who are nonresident aliens increased by 5% to 52%, with a corresponding decrease in the number classified as “White, non-Hispanic.” In fact, the number of White, non-Hispanic students receiving Master's degrees actually decreased by 6%.

Faculty Demographics (Tables 17-23)

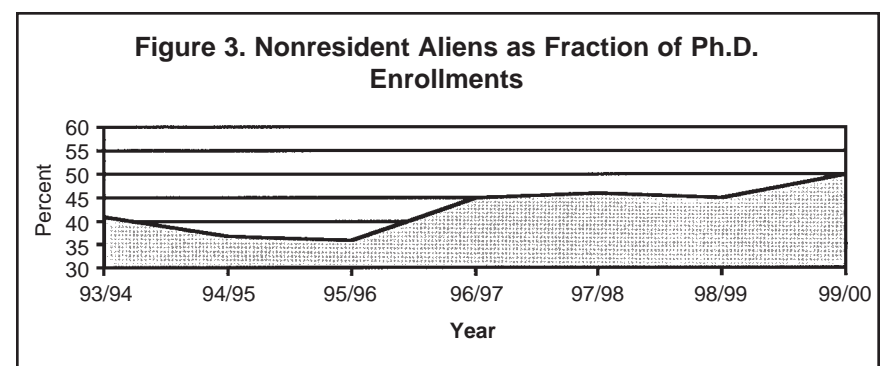
The total number of faculty increased by 14% over the past year to a total of 4,939 (Table 17). This increase was reflected in almost all categories, except for the number of post-docs that actually decreased by 42. Considering that 115 faculty are reported to have left academia (Table 23), the survey indicates 775 new faculty this year. Some of these are due to the increased number of respondents to the survey. Our Ph.D. production shows only 273 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.

This year's faculty growth to 4,939 was significantly greater than the prediction of 4,315 from last year's survey. This growth is greater

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	CS	CE	CS&CE
Male	689 (85%)	48 (86%)	737 (85%)
Female	123 (15%)	8 (14%)	131 (15%)
Total have Gender Data for	812	56	868
Unknown	13	0	13
Total	825	56	881

	CS	CE	CS&CE
Nonresident Alien	337 (45%)	32 (62%)	369 (47%)
African American, Non-Hispanic	14 (2%)	0 (0%)	14 (2%)
Native American or Alaskan Native	0 (0%)	0 (0%)	0 (0%)
Asian or Pacific Islander	73 (10%)	6 (12%)	79 (10%)
Hispanic	16 (2%)	1 (2%)	17 (2%)
White, Non-Hispanic	293 (40%)	13 (25%)	306 (39%)
Other/Not Listed	8 (1%)	0 (0%)	8 (1%)
Total have Ethnicity Data For	741	52	793
Ethnicity/Residency Unknown	84	4	88
Total	825	56	881



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 Researcher	35	9	3	15	24	16	17	16	10	13	158	(22%)	
Postdoc	6	9	1	4	10	0	7	5	7	3	52	(7%)	
Teaching Faculty	10	2	0	1	3	1	8	5	5	5	40	(6%)	(38%)
New Ph.D.s, Other Categories													
Other CS/CE Dept.	5	2	0	1	6	0	2	3	2	2	22	(3%)	
Non-CS/CE Dept.	5	0	0	0	1	0	0	0	1	0	7	(1%)	
Industry	54	37	10	26	83	50	20	26	34	19	359	(50%)	
Government	2	1	5	2	2	1	4	0	1	3	21	(3%)	(62%)
Self-Employed	2	0	0	1	1	1	0	0	0	1	6	(1%)	
Employed Abroad	5	5	0	4	2	0	1	4	2	3	26	(4%)	
Unemployed	0	0	1	0	0	0	0	2	0	0	3	(0%)	
Total have Employment Data for	128	67	20	55	135	71	62	63	64	52	717	100%	100%
Unknown	28	7	0	1	6	1	5	2	2	105	157		
Total	156	74	20	56	141	72	67	65	66	157	874		

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Table 5. New Ph.D Students in Fall 2000 by Department Type and Rank

Department, Rank	CS				CE				CS & CE	
	New Admit	MS to Ph.D.	Total	Ave. per Dept.	New Admit	MS to Ph.D.	Total	Ave. per Dept.	Total	Ave. per Dept.
US CS 1-12	338	42	380	34.5	0	0	0	0.0	380	34.5
US CS 13-24	299	34	333	27.8	0	1	1	0.1	334	27.8
US CS 25-36	268	21	289	24.1	0	0	0	0.0	289	24.1
US CS Other	749	99	848	7.6	71	8	79	0.7	927	8.3
Canadian	85	22	107	5.6	3	0	3	0.2	110	5.8
US CE	0	0	0	0.0	22	0	22	3.7	22	3.7
Total	1,739	218	1,957	11.4	96	9	105	0.6	2,062	12.0

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than can be accounted for by the increased number of survey respondents. For example, the number of faculty in the U.S. CS departments ranked 1 through 36 grew by 11%, whereas these departments predicted a 9% growth. In fact, it appears that many departments have established aggressive plans for recruiting over the next few years. Last year the surveyed departments predicted a 7% faculty growth over two years; this year, they predict 21% over 2 years on top of last year's actual growth. In light of our prediction that Ph.D. production will show, at best, modest

growth over the next few years, it is difficult to see where departments will find these new faculty.

Table 23 on faculty "losses" showed that a large number took academic positions elsewhere. Only 115 actually left academia (2.3% of the total) through death, retirement, or taking a nonacademic position. This compares with 112 (2.6% of total) last year. These numbers counter the prevailing fear that many of our faculty are leaving academia and seeking their fortunes at start-up companies.

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 (84%

male, 16% female) is very close to the split for new Ph.D. recipients (Table 2). However, the split is not uniform across faculty categories. New tenure-track faculty are slightly skewed toward males (88%), whereas new teaching faculty are significantly skewed toward females (26%).

It is interesting to compare the ethnicity data for new faculty (Table 20) to those for Ph.D. recipients (Table 3). Fully 58% of the new faculty are White, non-Hispanic, even though only 39% of the Ph.D. recipients are in this category. By contrast, only 17% of the new faculty are non-resident aliens, whereas fully 47% of the degree recipients are. 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.

Faculty Salaries (Tables 24-30)

The U.S. average salaries have increased by 7% for most categories of U.S. faculty, except for full professor salaries that grew by 4%. These increases are all higher than last year's numbers. Canadian salaries increased by 4%, 8%, 7%, and 3% for non-tenure track, assistant, associate, and full professors, respectively. These increases are somewhat lower than last year's.

Average salaries for new faculty increased by 7% for tenure-track and

by 8% for non-tenure-track teaching faculty, similar to the overall increases for these categories.

Average salaries for researchers and post-docs increased at much higher rates (39% and 30%, respectively), but the total numbers in these categories are too small to draw strong conclusions.

Concluding Observations

The continuing rise in bachelor's and master's students is creating a strong demand for faculty in computer science and engineering. On average, CS and CE departments want to grow by 21% over the next two years. Unfortunately, the production of new Ph.Ds is not rising to meet this demand. Even worse, historic demographics indicate that the fraction of graduating Ph.Ds who enter academia will decline as the proportion of Ph.D students who are nonresident aliens increases. Already many faculty positions are being filled by hiring faculty from other universities. This year 127 people made such a shift (Table 23), compared with 75 last year. We can expect more of this "poaching" as demand outstrips supply. This, plus greater competition for new graduates, will place upward pressure on junior faculty salaries and startup packages. Universities will need to look to sources beyond new Ph.Ds and existing faculty to meet their growth targets.

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

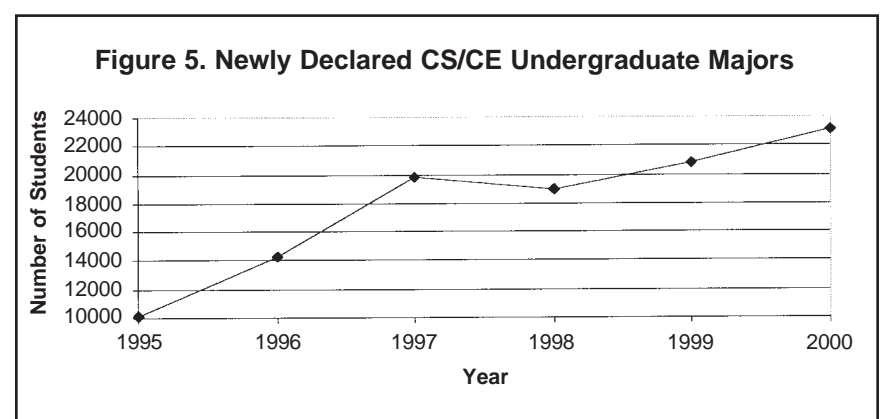
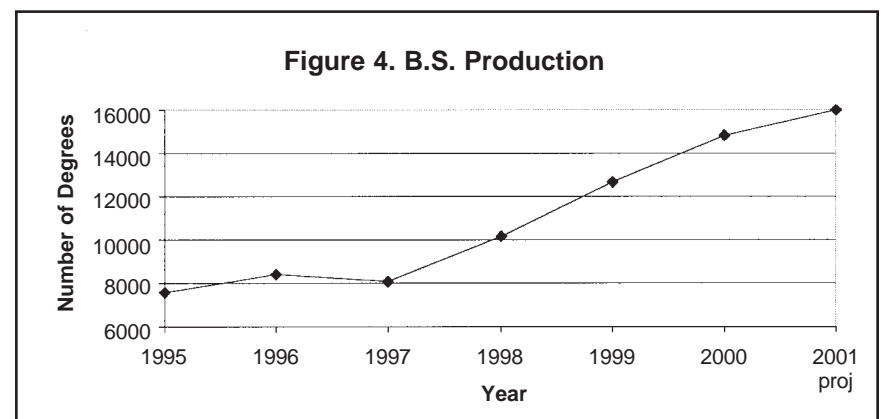
Department, Rank	CS	CE	CS & CE
US CS 1-12	1,452 (20%)	0 (0%)	1,452 (18%)
US CS 13-24	1,180 (16%)	14 (3%)	1,194 (15%)
US CS 25-36	914 (12%)	0 (0%)	914 (12%)
US CS Other	3,359 (45%)	331 (74%)	3,690 (47%)
Canadian	505 (7%)	10 (2%)	515 (7%)
US CE	2 (0%)	90 (20%)	92 (1%)
Total	7,412	445	7,857

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

	CS	CE	CS & CE
Male	5,882 (82%)	372 (84%)	6,254 (82%)
Female	1,319 (18%)	73 (16%)	1,392 (18%)
Total have Gender Data for	7,201	445	7,646
Unknown	211	0	
Total	7,412	445	7,857

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

	CS	CE	CS&CE
Nonresident Alien	3,210 (49%)	299 (70%)	3,509 (50%)
African American, Non-Hispanic	110 (2%)	1 (0%)	111 (2%)
Native American or Alaskan Native	4 (0%)	0 (0%)	4 (0%)
Asian or Pacific Islander	657 (10%)	26 (6%)	683 (10%)
Hispanic	81 (1%)	3 (1%)	84 (1%)
White, Non-Hispanic	2,279 (35%)	79 (18%)	2,358 (34%)
Other/Not Listed	192 (3%)	20 (5%)	212 (3%)
Total have Ethnicity Data For	6,533	428	6,961
Ethnicity/Residency Unknown	879	17	896
Total	7,412	445	7,857



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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	9,267 (80%)	1,824 (88%)	11,091 (81%)	4,254 (74%)	337 (80%)	4,591 (74%)
Female	2,372 (20%)	258 (12%)	2,630 (19%)	1,507 (26%)	83 (20%)	1,590 (26%)
Total have Gender Data for	11,639	2,082	13,721	5,761	420	6,181
Unknown	1,021	80	1,101	339	42	381
Total	12,660	2,162	14,822	6,100	462	6,562

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

	Bachelor's			Master's		
	CS	CE	Total	CS	CE	Total
Nonresident Alien	747 (9%)	101 (5%)	848 (8%)	2,668 (51%)	256 (63%)	2,924 (52%)
African American, Non-Hispanic	324 (4%)	72 (4%)	396 (4%)	104 (2%)	4 (1%)	108 (2%)
Native American or Alaskan Native	31 (0%)	4 (0%)	35 (0%)	74 (1%)	- (0%)	74 (1%)
Asian or Pacific Islander	1,988 (23%)	319 (17%)	2,307 (22%)	906 (17%)	32 (8%)	938 (17%)
Hispanic	292 (3%)	74 (4%)	366 (3%)	59 (1%)	4 (1%)	63 (1%)
White, Non-Hispanic	4,744 (55%)	1,106 (59%)	5,850 (56%)	1,275 (24%)	100 (25%)	1,375 (24%)
Other/Not Listed	524 (6%)	210 (11%)	734 (7%)	170 (3%)	8 (2%)	178 (3%)
Total have Ethnicity Data For	8,650	1,886	10,536	5,256	404	5,660
Ethnicity/Residency Unknown	4,010	276	4,286	844	58	902
Total	12,660	2,162	14,822	6,100	462	6,562

Table 11. Bachelor's Degree Candidates for 2000-2001 by Department Type and Rank

Department, Rank	CS	CE	CS & CE
US CS 1-12	1,794 (13%)	75 (3%)	1,869 (12%)
US CS 13-24	1,286 (9%)	395 (18%)	1,681 (11%)
US CS 25-36	1,626 (12%)	63 (3%)	1,689 (11%)
US CS Other	6,429 (47%)	1,381 (61%)	7,810 (49%)
Canadian	2,572 (19%)	210 (9%)	2,782 (17%)
US CE	30 (0%)	127 (6%)	157 (1%)
Total	13,737	2,251	15,988

Table 12. Master's Degree Candidates for 2000-2001 by Department Type and Rank

Department, Rank	CS	CE	CS & CE
US CS 1-12	730 (12%)	0 (0%)	730 (12%)
US CS 13-24	565 (10%)	3 (1%)	568 (9%)
US CS 25-36	431 (7%)	0 (0%)	431 (7%)
US CS Other	3,773 (64%)	354 (84%)	4,127 (66%)
Canadian	381 (6%)	10 (2%)	391 (6%)
US CE	- (0%)	53 (13%)	53 (1%)
Total	5,880	420	6,300

Table 13. New Master's Students in Fall 2000 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
	Ave. per Dept.		Ave. per Dept.		Total	Ave. per Dept.
US CS 1-12	681	61.9	0	0.0	681	61.9
US CS 13-24	590	53.6	2	0.2	592	53.8
US CS 25-36	322	26.8	0	0.0	322	26.8
US CS Other	3,753	34.8	437	4.0	4,190	38.8
Canadian	565	29.7	15	0.8	580	30.5
US CE	0		38	7.6	38	7.6
Total	5,911	36.7	492	3.0	6,403	38.6

Table 14. New Undergraduate Students in Fall 2000 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	750	1,504	136.7	0	65	5.9	1,569	142.6
US CS 13-24	182	1,440	120.0	0	426	35.5	1,866	155.5
US CS 25-36	717	1,816	151.3	26	58	4.8	1,874	156.2
US CS Other	4,171	11,198	103.7	0	2,027	18.8	13,225	122.5
Canadian	961	4,270	237.2	768	276	15.3	4,546	252.6
US CE	-	31	6.2	0	305	61.0	336	67.2
Total	6,781	20,259	122.0	794	3,157	19.0	23,416	141.1

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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 at Berkeley, Carnegie Mellon, Cornell, Princeton, University of Texas at Austin, University of Illinois at Urbana-Champaign, University of

Washington, University of Wisconsin at Madison, Harvard, and California Institute of Technology. All but one school in this ranking participated in the survey this year.

CS departments ranked 13-24 are: Brown, Yale, University of California at Los Angeles, University of Maryland at College Park, New York University, University of Massachusetts at Amherst, Rice, University of Southern California, University of Michigan, University of California at 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 at Chapel Hill, University of Rochester, State University of New York at Stony Brook, Georgia Institute of Technology, University of Arizona, University of California at 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 are unranked that responded to the survey include: Arizona State, Auburn, Boston, Brandeis, Brigham Young, Case Western Reserve, City University of New York, Clemson, William and Mary, Colorado School of Mines, Colorado State, Dartmouth, DePaul, Drexel, Florida Atlantic, Florida Institute of Technology, Florida International, Florida State, George Mason, George Washington, Iowa State, Johns Hopkins, Kansas State, Kent State, Lehigh, Louisiana State, Michigan State, Michigan Technological, Mississippi State, New Jersey Institute of Technology, New Mexico State University, New Mexico Tech, North Carolina State, North Dakota State, Northeastern,

Nova Southeastern, Oakland, Ohio State, Oklahoma State, Old Dominion, Oregon Graduate Institute, Oregon State, Pennsylvania State, Polytechnic, Portland State, Rensselaer Polytechnic Institute, Southern Methodist, State University of New York (Albany and Buffalo), Stevens Institute, Syracuse, Temple, Texas A&M, Texas Tech, Tufts, Tulane, Washington State, and Washington (St. Louis). **University of:** Alabama (Birmingham, Huntsville, and Tuscaloosa), Arkansas, California (Davis, Riverside, Santa Barbara, and Santa Cruz), Central Florida, Cincinnati, Colorado (Boulder and Colorado Springs), Georgia, Illinois (Chicago), Louisiana (Lafayette), Maryland (Baltimore Co.), Massachusetts (Lowell), Missouri (Rolla and Columbia), Nebraska (Lincoln), Nevada (Las Vegas), Notre Dame, South Florida, Tennessee (Knoxville), Texas (Arlington, Dallas, and El Paso), Wisconsin (Milwaukee), Connecticut, Delaware, Denver, Florida, Hawaii, Houston, Idaho, Iowa, Kansas, Kentucky, Minnesota, Mississippi, New Hampshire, New Mexico, North

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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	1,279 (8%)	0	1,279
US CS 13-24	1,198 (8%)	12	1,210
US CS 25-36	581 (4%)	0	581
US CS Other	10,880 (70%)	1,009	11,889
Canadian	1,669 (11%)	30	1,699
US CE	- (0%)	79	79
Total	15,607	1,130	16,737

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	107	6,716	610.5	0	151	13.7	6,867	624.3
US CS 13-24	333	5,686	473.8	41	1,569	130.8	7,255	604.6
US CS 25-36	1,912	5,659	471.6	0	112	9.3	5,771	480.9
US CS Other	8,905	38,170	353.4	1,270	8,359	77.4	46,529	430.8
Canadian	1,364	10,431	579.5	0	1,454	80.8	11,885	660.3
US CE	0	118	23.6	168	886	177.2	1,004	200.8
Total	12,621	66,780	402.3	1,479	12,531	72.9	79,311	477.8

Table 17. Actual and Anticipated Faculty Sizes by Position

	Actual		Projected		Expected Two-Year Growth
	2000-2001	2001-2002	2001-2002	2002-2003	
Tenure-Track	3,591	3,989	3,989	4,366	775 (22%)
Researcher	345	347	347	348	3 (1%)
Postdoc	208	263	263	316	108 (52%)
Teaching Faculty	643	704	704	761	118 (18%)
Other/Not Listed	152	162	162	175	23 (15%)
Total	4,939	5,465	5,465	5,966	1,027 21%

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

Department Rank	Actual		Projected		Expected Two-Year Growth
	2000-2001	2001-2002	2001-2002	2002-2003	
US CS 1-12	684	742	742	760	76 (11%)
US CS 13-24	479	516	516	564	85 (18%)
US CS 25-36	402	431	431	488	86 (21%)
US CS Other	2,587	2,876	2,876	3,161	574 (22%)
Canadian	677	777	777	859	182 (27%)
US CE	110	123	123	134	24 (22%)
Total	4,939	5,465	5,465	5,966	1,027 (21%)

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	Tenure-Track	Researcher	Postdoc	Teaching Faculty	Other	Total
Male	300 (88%)	43 (93%)	63 (84%)	122 (74%)	10 (83%)	538 (84%)
Female	39 (12%)	3 (7%)	12 (16%)	43 (26%)	2 (17%)	99 (16%)
Total	339 (53%)	46 (7%)	75 (12%)	165 (26%)	12 (2%)	637
Unknown	2	0	0	1	0	640

	Tenure-Track	Researcher	Postdoc	Teaching Faculty	Other	Total
Nonresident Alien	54 (17%)	7 (15%)	34 (50%)	11 (7%)	3 (25%)	109
African American, Non-Hispanic	2 (1%)	0 (0%)	0 (0%)	4 (2%)	0 (0%)	6
Native American or Alaskan Native	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	1
Asian or Pacific Islander	59 (19%)	6 (13%)	4 (6%)	14 (9%)	0 (0%)	83
Hispanic	6 (2%)	0 (0%)	0 (0%)	6 (4%)	0 (0%)	12
White, Non-Hispanic	182 (58%)	32 (70%)	26 (38%)	125 (78%)	9 (75%)	374
Other/Not Listed	9 (3%)	1 (2%)	4 (6%)	0 (0%)	0 (0%)	14
Total have Ethnicity Data For	312	46	68	161	12	599
Ethnicity/Residency Unknown	29	0	7	5	0	41
Total	341	46	75	166	12	640

	Full	Associate	Assistant	Teaching Faculty	Total
Male	1,470 (92%)	1,009 (87%)	781 (86%)	531 (74%)	3,791 (87%)
Female	125 (8%)	148 (13%)	123 (14%)	190 (26%)	586 (13%)
Total have Gender Data for	1,595 (36%)	1,157 (26%)	904 (21%)	721 (16%)	4,377

	Full	Associate	Assistant	Teaching Faculty	Total
Nonresident Alien	11 (1%)	18 (2%)	125 (15%)	35 (5%)	189 (5%)
African American, Non-Hispanic	4 (0%)	4 (0%)	9 (1%)	11 (2%)	28 (1%)
Native American or Alaskan Native	0 (0%)	0 (0%)	1 (0%)	2 (0%)	3 (0%)
Asian or Pacific Islander	266 (18%)	246 (23%)	149 (18%)	43 (6%)	704 (17%)
Hispanic	36 (2%)	20 (2%)	23 (3%)	8 (1%)	87 (2%)
White, Non-Hispanic	1,143 (77%)	753 (71%)	521 (62%)	574 (84%)	2,991 (73%)
Other/Not Listed	28 (2%)	26 (2%)	18 (2%)	13 (2%)	85 (2%)
Total have Ethnicity Data For	1,488	1,067	846	686	4,087
Ethnicity/Residency Unknown	121	96	63	36	316
Total	1,609	1,163	909	722	4,403

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Texas, Oklahoma, Oregon, Pittsburgh, South Carolina, Utah, Wyoming, Vanderbilt, Virginia Polytechnic, Wayne State, West Virginia, Western Michigan, Worcester Polytechnic, and Wright State.

Computer Engineering departments participating in the survey this year include: Carnegie Mellon, Northwestern, Ohio State, Oregon State, Rensselaer Polytechnic, and University of New Mexico.

Canadian departments participating in the survey include: Concordia, Dalhousie, McGill, Memorial, Queen's, Simon Fraser, and York.

University of: Alberta, British Columbia, Calgary, Montreal, Quebec (Montreal), Regina, Saskatchewan, Toronto CS, Toronto ECE, Victoria, Waterloo, and Western Ontario.

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Jean Smith, Jay Vegso, and Bill Aspray assisted with the data collection, tabulation, and analysis for this survey. Stu Zweben provided valuable review comments and suggestions. We thank them for their assistance.

Endnotes

¹The 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.

²Although 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.

	Total
Died	4
Retired	54
Took Academic Position Elsewhere	127
Took Nonacademic Position	57
Remained, Changed to Part Time	15
Other	13
Unknown	5
Total	275

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 versus 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. Nine-month Salaries, 142 Responses of 163 US CS Computer Science Departments

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	581	\$18,000	\$45,202	\$95,604	\$51,909	\$31,500	\$60,157	\$110,000
Assistant	762	\$29,997	\$64,895	\$77,000	\$68,628	\$48,284	\$72,464	\$97,000
Associate	923	\$42,616	\$70,340	\$98,000	\$76,997	\$64,949	\$85,355	\$150,000
Full	1,269	\$48,000	\$81,029	\$108,300	\$99,690	\$79,100	\$129,367	\$253,485

Table 25. Nine-month Salaries, 11 Responses of 12 US CS Computer Science Departments Ranked 1-12

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	99	\$35,856	\$58,287	\$95,604	\$68,407	\$59,800	\$82,512	\$108,000
Assistant	104	\$46,800	\$69,737	\$75,006	\$75,121	\$72,300	\$80,268	\$90,800
Associate	81	\$68,560	\$78,077	\$98,000	\$83,746	\$76,400	\$89,083	\$98,000
Full	216	\$48,000	\$83,683	\$95,000	\$112,910	\$134,000	\$162,626	\$203,000

Table 26. Nine-month Salaries, 12 Responses of 12 US Computer Science Departments Ranked 13-24

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	53	\$41,400	\$56,797	\$68,200	\$62,252	\$60,000	\$69,021	\$80,000
Assistant	68	\$66,200	\$70,693	\$77,000	\$75,015	\$73,332	\$80,850	\$97,000
Associate	63	\$61,520	\$77,884	\$88,000	\$83,599	\$75,200	\$90,254	\$105,300
Full	183	\$69,103	\$84,306	\$108,300	\$115,597	\$143,000	\$166,476	\$253,485

Table 27. Nine-month Salaries, 12 Responses of 12 US Computer Science Departments Ranked 25-36

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	46	\$36,000	\$51,081	\$71,080	\$59,308	\$46,350	\$69,076	\$110,000
Assistant	76	\$61,000	\$67,619	\$73,250	\$70,929	\$61,000	\$73,918	\$83,243
Associate	83	\$61,427	\$74,571	\$86,803	\$82,481	\$81,370	\$95,194	\$135,625
Full	140	\$67,574	\$85,902	\$98,000	\$109,100	\$105,000	\$149,142	\$186,150

Table 28. Nine-month Salaries, 107 Responses of 127 US Computer Science Departments Ranked Higher than 36 or Unranked

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	383	\$18,000	\$41,579	\$85,835	\$47,853	\$31,500	\$55,433	\$100,000
Assistant	514	\$29,997	\$63,371	\$76,844	\$66,906	\$48,284	\$70,464	\$88,200
Associate	696	\$42,616	\$68,336	\$88,750	\$75,062	\$64,949	\$83,446	\$150,000
Full	730	\$52,898	\$79,808	\$102,147	\$95,371	\$79,100	\$119,286	\$199,027

Table 29. Twelve-month Salaries, 19 Responses of 23 Canadian Computer Science Departments (Canadian Dollars)

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	52	\$34,200	\$48,704	\$71,467	\$53,162	\$39,008	\$60,633	\$95,600
Assistant	128	\$47,892	\$64,421	\$88,489	\$70,056	\$52,980	\$76,758	\$123,718
Associate	193	\$55,000	\$68,858	\$92,970	\$82,874	\$74,604	\$97,668	\$150,000
Full	256	\$48,400	\$79,623	\$108,803	\$98,844	\$80,964	\$123,079	\$176,000

Table 30. Nine-month Salaries for New Ph.Ds, Responding US CS and CE Departments

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Tenure-Track	95	\$45,000	\$68,378	\$80,000	\$68,915	\$45,000	\$69,439	\$80,000
Researcher	3	\$69,000	\$79,945	\$85,835	\$79,945	\$69,000	\$79,945	\$85,835
Non-Tenure Teaching Faculty	9	\$42,000	\$54,908	\$70,000	\$54,908	\$42,000	\$54,908	\$70,000
Postdoc	18	\$30,000	\$45,637	\$70,000	\$48,001	\$30,360	\$51,637	\$70,000