1998-1999 Taulbee Survey

Ph.D. Enrollment Levels Off; M.S. and Undergrad Continue to Rise

By Mary Jane Irwin and Frank Friedman

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%)

This article and the accompanying tables and figures present the results of the 29th 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 covers 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 (1998-99). Data for new students in all categories and total enrollments for Master's and Bachelor's refer to the current academic year (1999-2000).~~ Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2000. Responses received by January 14, 2000 are included in the tables.

The survey results are from Ph.D.-granting departments only. Two hundred and three departments were surveyed, compared with 182 departments last year. This increase was due to wider canvassing by CRA staff to get a more complete picture of the set of schools awarding CS and CE doctorates, and the addition of a few newly formed departments. Through last-minute telephone calls to departments that had not responded to the survey, we were able to obtain Ph.D. production numbers from 84% of the schools (compared with 77% last year). Overall, 156 departments out of 203 departments returned their survey forms. We thank all respondents who completed this year's questionnaire. Departments that participated are listed at the end of this article.

Respondents provided answers to most questions, but in some cases questions were left unanswered. Participation rates for individual questions varied from 75% to 80%. The overall response rate was 77%, about the same as last year. Figure 1 shows the number of departments that responded to the survey/number of schools polled for the faculty section of the survey from 1995 to 1999.

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% this year, 37% last year) makes trend analysis for CE risky. Overall, the set of schools that responded this year was very similar to last, and the response rate was essentially the same. The high rate of return this year for Canadian schools (83% compared with 67% last year) must be considered when trying to determine trends with respect to Canadian data.

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 two questions were dropped from the survey. One question, added just last year, asked how many years it takes a student to complete the Ph.D. program (5.014 years reported last year). The information provided by this question, compared with the difficulty of collecting the data, suggests that this question only needs to be asked periodically. Another question that was dropped was how many new Ph.D. students had Bachelor's degrees in CS or CE. The data had not changed significantly in several years and, once again, proved difficult for departments to collect.

The question asking for projected faculty sizes was reduced from a five-year to a two-year window, since data further out than two years is probably unreliable.

One question was added on the number of students passing the Ph.D. preliminary/comprehensive (thesis proposal) exam. This was an attempt to fill in the gap in the Ph.D. production pipeline between passing the Ph.D. qualifying exam and graduation, in the hope that we could learn more about when students are leaving their graduate degree programs. The question on the number of Bachelor's students enrolled was expanded to capture both the number of majors and premajors (those students who have declared, but have not yet been officially admitted into the department), in the hope of forecasting future undergraduate loads more accurately.

This year, the faculty demographic and salary data on Instructors and Lecturers was combined into one category—non-tenure-track teaching faculty. As in previous surveys, differentiating between CS and CE counts for graduate students for those departments with combined programs (CSE) continued to be a problem this year.

Degree Production *(Tables 1-6)*

As shown in Table 1, a total of 944 Ph.D. degrees were awarded in 1999 by the 171 (84%) responding departments.

While this is a small increase from the 933 degrees awarded in 1998, only 144 departments (77%) responded last year. In both years, virtually all of the departments producing large numbers of doctorates were included in the survey data; the additional schools responding this year added only marginally to the total. Figure 2 shows the Ph.D. production rate from 1989 to 1999.

The prediction from last year's survey that 1,128 Ph.D. degrees would be awarded in 1999 was, as usual, overly optimistic. Using the same "optimism factor" of 0.85 as we used last year, the prediction for next year of 1,167 translates to 922 new Ph.D.s in 2000. One cause for concern is that the number of students passing the Ph.D. qualifier is down by 150 (or 14%) from last year.

Table 4 shows area of specialization versus types of first ap-

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Figure 2. Ph.D. Production 1989-1999

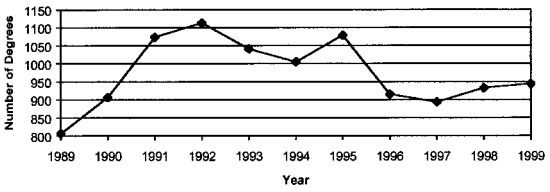

Table 1. Ph.D. Production by Department Type and Rank

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	200	16.7	241	20.1	180	15.0	177	14.8
US CS 13-24	142	11.8	170	14.2	176	14.7	144	12.0
US CS 25-36	65	5.9	111	10.1	117	10.6	112	10.2
US CS Other	445	4.0	508	5.5	369	4.0	245	2.7
Canadian	65	3.4	99	5.2	60	3.2	62	3.3
US CE	27	3.9	38	5.4	28	4.0	30	4.3
Total	**944**	**5.5**	**1,167**	**7.6**	**930**	**6.1**	**770**	**5.0**

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pointments for Ph.D. recipients in 1999. While similar to 1998, there was a small increase (from 35% to 38%) this year in the percentage of recipients taking positions in Ph.D.-granting departments. This increase came at the expense of recipients taking positions in government, industry, and abroad.

The number of Master's degrees awarded (Tables 5 and 6, CS plus CE), which increased by 4.3% in 1997 with 130 (80%) departments reporting, and by 11.1% in 1998 with 141 (77%) departments reporting, was up again by 13.1% in 1999 with 156 (77%) departments reporting.

The significant increase in Master's degrees in 1999 probably explains the decrease in the number of students taking the Ph.D. qualifier. Due to the excellent job market and companies that are now willing to hire Master's graduates with H1-B visas, students who originally planned to pursue a Ph.D. are leaving academia with only a Master's degree. The number of Master's degrees for 1999-2000 is projected to be up an additional 3%.

The growth in undergraduate enrollments over the past few years continues to translate into significant increases in the number of Bachelor's degrees awarded (see Tables 5 and 6). Historically, the Ph.D.-granting departments have awarded approximately one-third of the nation's Bachelor's degrees in CS and CE. There were 12,692 awarded in 1999 by the 150 (74%) responding departments, up 25% from the 10,161 awarded in 1998 by the 138 (76%) responding departments. It is projected that 13,883 Bachelor's degrees will be

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

	CS	CE	CS & CE
Male	642 (85%)	86 (91%)	728 (85%)
Female	115 (15%)	9 (9%)	124 (15%)
Total have Gender Data for	**757**	**95**	**852**

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

	CS	CE	CS & CE
Nonresident Alien	300 (41%)	44 (56%)	344 (42%)
African American, Non-Hispanic	15 (2%)	2 (3%)	17 (2%)
Native American or Alaskan Native	0 (0%)	1 (0%)	1 (0%)
Asian or Pacific Islander	66 (9%)	9 (7%)	75 (9%)
Hispanic	14 (2%)	4 (1%)	18 (2%)
White, Non-Hispanic	324 (44%)	20 (33%)	344 (42%)
Other/Not Listed	16 (2%)	3 (0%)	19 (2%)
Total have Ethnicity Data for	**735**	**83**	**818**
Ethnicity/Residency Unknown	22	12	34
Total	**757**	**95**	**852**

Figure 3. B.S. Production 1995-2000

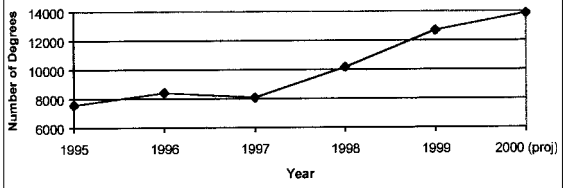

Table 4. Employment of New Ph.D. Recipients by Specialty

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	30	17	4	15	22	21	18	16	12	17	**172**	**(22%)**
Researchers	7	11	3	6	3	2	3	5	4	3	**47**	**(6%)**
Postdocs	16	2	2	1	4	2	8	3	2	5	**45**	**(6%)**
Teaching Faculty	7	2	1	2	3	1	5	1	2	5	**29**	**(4%)**
New Ph.D.s, Other Categories												
Other CS/CE Dept.	7	2	3	2	2	2	2	3	2	0	**25**	**(3%)**
Non-CS/CE Dept.	1	0	0	0	0	1	0	0	0	0	**2**	**(0%)**
Industry	66	48	14	17	58	25	16	36	34	64	**378**	**(49%)**
Government	5	1	0	1	1	3	3	3	1	1	**19**	**(2%)**
Self-Employed	5	0	0	2	3	2	0	0	2	10	**24**	**(3%)**
Employed Abroad	7	2	0	2	3	1	1	1	1	5	**23**	**(3%)**
Unemployed	2	1	0	0	1	0	0	0	0	6	**10**	**(1%)**
Total have Employment Data for	**153**	**86**	**27**	**48**	**100**	**60**	**56**	**68**	**60**	**116**	**774**	**(100%)**
Unknown	13	3	2	1	7	4	1	0	7	40	**78**	
Total	**166**	**89**	**29**	**49**	**107**	**64**	**57**	**68**	**67**	**156**	**852**	

Table 5. Gender of Bachelor's and Master's Recipients

	Bachelor's			Master's		
	CS	CE	Total	CS	CE	Total
Male	7,999 (82%)	1,510 (88%)	9,509 (83%)	3,641 (74%)	468 (75%)	4,109 (74%)
Female	1,745 (18%)	207 (12%)	1,952 (17%)	1,311 (26%)	156 (25%)	1,467 (26%)
Total have Gender Data for	**9,744**	**1,717**	**11,461**	**4,952**	**624**	**5,576**
Unknown	1,065	166	1,231	3	0	3
Total	**10,809**	**1,883**	**12,692**	**4,955**	**624**	**5,579**

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Table 6. Ethnicity of Bachelor's and Master's Recipients

	Bachelor's			Master's		
	CS	CE	Total	CS	CE	Total
Nonresident Alien	623 (9%)	81 (6%)	704 (8%)	2,032 (45%)	370 (65%)	2,402 (47%)
African American, Non-Hispanic	257 (4%)	70 (5%)	327 (4%)	61 (1%)	3 (1%)	64 (1%)
Native American or Alaskan Native	23 (0%)	6 (0%)	29 (0%)	13 (0%)	- (0%)	13 (0%)
Asian or Pacific Islander	1,580 (22%)	275 (19%)	1,855 (21%)	792 (18%)	75 (13%)	867 (17%)
Hispanic	295 (4%)	87 (6%)	382 (4%)	47 (1%)	3 (1%)	50 (1%)
White, Non-Hispanic	4,286 (59%)	885 (61%)	5,171 (60%)	1,341 (30%)	118 (21%)	1,459 (29%)
Other/Not Listed	156 (2%)	56 (4%)	212 (2%)	223 (5%)	4 (1%)	227 (4%)
Total have Ethnicity Data for	**7,220**	**1,460**	**8,680**	**4,509**	**573**	**5,082**
Ethnicity/Residency Unknown	3,589	423	4,012	446	51	497
Total	**10,809**	**1,883**	**12,692**	**4,955**	**624**	**5,579**

Table 7. New Undergraduate Students in Fall 1999 by Department Type and Rank

	CS			CE			CS & CE Majors	
Department, Rank	Premajor	Major	Ave. Major per Dept.	Premajor	Major	Ave. Major per Dept	Total	Ave. Major per Dept
US CS Ranked 1-12	-	1,604	146	205	66	6	1,670	151.8
US CS Ranked 13-24	-	1,655	138	-	399	33	2,054	171.2
US CS Ranked 25-36	174	1,203	109	20	-	-	1,203	109.4
US CS Other	474	9,191	103	-	1,732	19	10,923	122.7
Canadian CS	2,149	3,773	199	583	409	22	4,182	220.1
US CE	1,434	283	40	-	472	67	755	107.9
Total	**4,231**	**17,709**	**118.9**	**808**	**3,078**	**20.7**	**20,787**	**139.5**

Table 8. New Master's Students in Fall 1999 by Department Type and Rank

	CS		CE		CS & CE	
Department, Rank	Total	Ave. per Dept.	Total	Ave. per Dept.	Total	Ave. per Dept.
US CS 1-12	631	52.6	0	0.0	631	52.6
US CS 13-24	540	45.0	38	3.2	578	48.2
US CS 25-36	255	23.2	0	0.0	255	23.2
US CS Other	2,799	30.4	267	2.9	3066	33.3
Canadian	442	23.3	37	1.9	479	25.2
US CE	178	25.4	154	22.0	332	47.4
Total	**4,845**	**31.7**	**496**	**3.2**	**5,341**	**34.9**

Table 9. New Ph.D. Students in Fall 1999 by Department Type and Rank

	CS				CE				CS & CE	
Department, Rank	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	340	47	387	32.3	0	0	0	0.0	387	32.3
US CS 13-24	194	25	219	18.3	40	1	41	3.4	260	21.7
US CS 25-36	278	4	282	25.6	0	0	0	0.0	282	25.6
US CS Other	620	117	737	8.0	50	11	61	0.7	798	8.7
Canadian	62	16	78	4.1	3	1	4	0.2	82	4.3
US CE	18	0	17	2.6	45	18	63	9.0	81	11.6
Total	**1,512**	**209**	**1,721**	**11.2**	**138**	**31**	**169**	**1.1**	**1,890**	**12.4**

Table 10. Bachelor's Degree Program Total Enrollment by Department Type and Rank

	CS			CE			CS & CE Majors	
Department, Rank	Premajor	Major	Average Major per Dept.	Premajor	Major	Average Major per Dept	Total	Average Major per Dept
US CS 1-12	-	6,409	582.6	-	201	18.3	6,610	600.9
US CS 13-24	442	5,404	450.3	102	1,521	126.8	6,925	577.1
US CS 25-36	836	4,393	399.4	-	-	0.0	4,393	399.4
US CS Other	5,712	28,848	324.1	1,112	5,857	65.8	34,705	389.9
Canadian	1,626	12,007	631.9	-	1,444	76.0	13,451	707.9
US CE	141	533	76.1	366	1,200	171.4	1,733	247.6
Total	**8,757**	**57,594**	**386.5**	**1,580**	**10,223**	**68.6**	**67,817**	**455.1**

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Table 11. Master's Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE	CS & CE
US CS 1-12	1,027	(8%)	0	1,027
US CS 13-24	1,179	(9%)	85	1,264
US CS 25-36	516	(4%)	0	516
US CS Other	8,367	(67%)	696	9,063
Canadian	1,118	(9%)	119	1,237
US CE	225	(2%)	498	723
Total	**12,432**		**1,398**	**13,830**

Table 12. Ph.D. Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1,432	(22%)	0	(0%)	1,432	(20%)
US CS 13-24	1,019	(15%)	88	(16%)	1,107	(15%)
US CS 25-36	833	(13%)	0	(0%)	833	(12%)
US CS Other	2,858	(43%)	264	(47%)	3,122	(44%)
Canadian	431	(7%)	51	(9%)	482	(7%)
US CE	24	(0%)	160	(28%)	184	(3%)
Total	**6,597**		**563**		**7,160**	

Table 13. Gender of Ph.D. Program Total Enrollment

	CS		CE		CS & CE	
Male	5,418	(83%)	465	(83%)	5,883	(83%)
Female	1,142	(17%)	92	(17%)	1,234	(17%)
Total have Gender Data for	**6,560**		**557**		**7,117**	
Unknown	37		6		43	
Total	**6,597**		**563**		**7,160**	

Table 14. Ethnicity of Ph.D. Program Total Enrollment

	CS		CE		CS & CE	
Nonresident Alien	2,601	(44%)	263	(56%)	2,864	(45%)
African American, Non-Hispanic	125	(2%)	12	(3%)	137	(2%)
Native American or Alaskan Native	3	(0%)	1	(0%)	4	(0%)
Asian or Pacific Islander	593	(10%)	31	(7%)	624	(10%)
Hispanic	93	(2%)	6	(1%)	99	(2%)
White, Non-Hispanic	2,360	(40%)	156	(33%)	2,516	(39%)
Other/Not Listed	127	(2%)	0	(0%)	127	(2%)
Total have Ethnicity Data for	**5,902**		**469**		**6,371**	
Ethnicity/Residency Unknown	695		94		789	
Total	**6,597**		**563**		**7,160**	

Table 15. Bachelor's Degree Candidates for 1999-2000 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1,727	(15%)	61	(3%)	1,788	(13%)
US CS 13-24	1,182	(10%)	471	(24%)	1,653	(12%)
US CS 25-36	1,198	(10%)	-	(0%)	1,198	(9%)
US CS Other	5,114	(43%)	973	(49%)	6,087	(44%)
Canadian	2,531	(21%)	216	(11%)	2,747	(20%)
US CE	155	(1%)	255	(13%)	410	(3%)
Total	**11,907**		**1,976**		**13,883**	

Table 16. Master's Degree Candidates for 1999-2000 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	682	(13%)	0	(0%)	682	(12%)
US CS 13-24	456	(9%)	52	(9%)	508	(9%)
US CS 25-36	441	(9%)	0	(0%)	441	(8%)
US CS Other	3,151	(61%)	295	(51%)	3,446	(60%)
Canadian	355	(7%)	32	(6%)	387	(7%)
US CE	74	(1%)	194	(34%)	268	(5%)
Total	**5,159**		**573**		**5,732**	

Figure 4. Number of Ph.D.s granted to Three Underrepresented Minorities 1996-1999

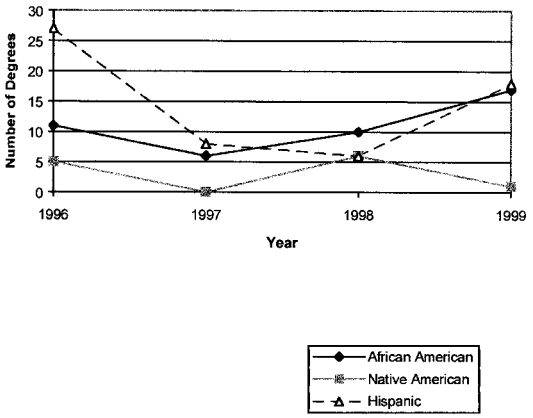
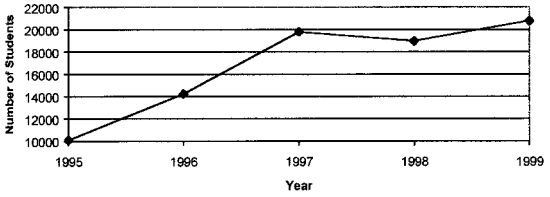


Figure 5. New Undergraduate Enrollment 1995-1999



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awarded in the academic year 2000 (up an additional 9%). Figure 3 shows the B.S. production rate (CS plus CE) from 1995 to 2000. The largest rate of growth, 45%, was in the CE programs. However, this number does include the CE Bachelor's degrees awarded by a number of departments in the CS grouping that offer both CS and CE degrees (e.g., University of Washington, Penn State University, University of Michigan, University of Florida, and Auburn University).

Once again, the ethnicity and gender statistics for Ph.D., Master's, and Bachelor's degree recipients (Tables 2, 3, 5, and 6) remained relatively static, with a few exceptions. The percentage of Ph.D. CE degrees awarded to women dropped from 17% last year to 9% this year. Once again, this may be a reflection of the low response rate for CE departments. The numbers of Ph.D. recipients for three underrepresented groups for the past four years are depicted in Figure 4.

Student Enrollment *(Tables 7-16)*

New enrollment in Ph.D. programs (Table 9, CS plus CE) is up 6% compared with last year. This is a much smaller increase than last year's growth rate of 24%. Total Ph.D. enrollment (see Table 12) is 7,160, up less than 1% from last year. These two data points together indicate a leveling of Ph.D. enrollments.

New enrollment in M.S. programs (Table 8, CS plus CE) is up 26%, improving on last year's increase of 24%. In particular, the US CE new enrollment increased by 107% with 5 of 24 schools reporting this year, compared with 7 of 19 last year. Also worth noting is that the new enrollments in Canadian M.S. programs (CS plus CE) increased by 79% over last year, with 19 of 23 schools reporting this year compared with 12 of 18 last year. Total M.S. enrollment (Table 11, CS plus CE) increased by 13%; CE alone increased 43%.

Figure 5 shows the trend in new undergraduate enrollments (CS plus CE, excluding premajors) for the period 1996 to 1999 (see also Table 7). The percentage increase this year over last was 10% for CS and 7% for CE. This growth is primarily due to the increase in new CS enrollment for Canadian schools of a whopping 99%.

This is the first year that data on premajors were collected. Some departments surveyed do not accept students as majors until

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Table 17. Anticipated Faculty Size by Position

	1999-2000	2000-2001	2001-2001	Expected Two-Year Growth
Tenure-Track	3,183	3,166	3,388	205 (6%)
Researcher	298	306	345	48 (16%)
Postdoc	250	241	274	24 (9%)
Teaching Faculty	505	496	538	33 (7%)
Other/Not Listed	109	106	122	13 (12%)
Total	**4,344**	**4,315**	**4,667**	**323 (7%)**

Table 18. Anticipated Faculty by Department Type and Rank

Department, Rank	1999-2000	2000-2001	2001-2001	Expected Two-Year Growth
US CS 1-12	582	644	690	108 (19%)
US CS 13-24	435	497	540	104 (24%)
US CS 25-36	390	388	414	25 (6%)
US CS Other	2,130	1,962	2,127	-3 (0%)
Canadian	632	646	721	90 (14%)
US CE	176	178	175	-1 (-1%)
Total	**4,344**	**4,315**	**4,667**	**323 (7%)**

Table 19. Gender of Newly Hired Faculty

	Tenure-Track	Researcher	Postdoc	Teaching Faculty	Other	Total
Male	285 (87%)	44 (92%)	73 (87%)	110 (77%)	9 (75%)	521 (85%)
Female	42 (13%)	4 (8%)	11 (13%)	32 (25%)	3 (25%)	92 (15%)
Total	**327 (53%)**	**48 (8%)**	**84 (14%)**	**142**	**12 (2%)**	**613**

Table 20. Ethnicity of Newly Hired Faculty

	Tenure-Track	Researcher	Postdoc	Teaching Faculty	Other	Total
Nonresident Alien	46 (15%)	9 (19%)	32 (38%)	12 (9%)	1 (8%)	100
African American, Non-Hispanic	3 (1%)	1 (2%)	0 (0%)	5 (4%)	0 (0%)	9
Native American or Alaskan Native	2 (1%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	3
Asian or Pacific Islander	63 (20%)	11 (23%)	13 (15%)	13 (9%)	0 (0%)	100
Hispanic	3 (1%)	2 (4%)	0 (0%)	2 (1%)	0 (0%)	7
White, Non-Hispanic	182 (58%)	14 (30%)	34 (40%)	105 (75%)	9 (75%)	344
Other/Not Listed	14 (4%)	10 (21%)	5 (6%)	2 (1%)	2 (17%)	33
Total have Ethnicity Data for	**313**	**47**	**84**	**140**	**12**	**596**
Ethnicity/Residency Unknown	14	1	0	2	0	17
Total	**327**	**48**	**84**	**142**	**12**	**613**

Table 21. Gender of Current Faculty

	Full	Associate	Assistant	Teaching Faculty	Total
Male	1,321 (92%)	950 (88%)	624 (84%)	428 (75%)	3,323 (87%)
Female	115 (8%)	132 (12%)	120 (16%)	146 (25%)	513 (13%)
Total	**1,436 (37%)**	**1,082 (28%)**	**744 (19%)**	**574 (15%)**	**3,836**

Table 22. Ethnicity of Current Faculty

	Full	Associate	Assistant	Teaching Faculty	Total
Nonresident Alien	34 (2%)	17 (2%)	98 (14%)	27 (5%)	176 (5%)
African American, Non-Hispanic	4 (0%)	5 (0%)	9 (1%)	12 (2%)	30 (1%)
Native American or Alaskan Native	5 (0%)	7 (1%)	8 (1%)	1 (0%)	21 (1%)
Asian or Pacific Islander	231 (17%)	216 (21%)	131 (18%)	49 (9%)	627 (17%)
Hispanic	18 (1%)	14 (1%)	12 (2%)	6 (1%)	50 (1%)
White, Non-Hispanic	1,063 (76%)	744 (71%)	430 (60%)	465 (82%)	2,702 (72%)
Other/Not Listed	35 (3%)	48 (5%)	33 (5%)	8 (1%)	124 (3%)
Subtotal	**1,390**	**1,051**	**721**	**568**	3,730
Ethnicity/Residency Unknown	46	31	23	6	106
Total	**1,436**	**1,082**	**744**	**574**	3,836

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Table 23. Faculty Losses

	Total
Died	5
Retired	53
Took Academic Position Elsewhere	75
Took Nonacademic Position	54
Remained, Changed to Part Time	11
Other	10
Unknown	3
Total	**211**

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the end of their sophomore year. Undoubtedly some departments included such premajors in their major counts in previous survey years. Looking at major counts only, total undergraduate enrollment for CS was down slightly (less than 1%), while total enrollment for CE was up 12% over last year.

Reversing earlier trends of a slow but steady increase in the percentage of women enrolled in CS Ph.D. programs, the number declined this year to 1,142 (down to 17%, see Table 13), compared with 1,247 last year. There were no significant changes in the ethnicity of CS Ph.D. students (Table 14). The percentage of nonresident alien CE Ph.D. students went up slightly this year from 53% to 56% and the percentage of African Americans jumped from less than 1% to 3%, balanced with a decline in the percentage of Asians and Pacific Islanders from 11% last year to 7% this year.

Faculty Demographics *(Tables 17-23)*

The number of faculty in tenure-track positions (Table 17) increased by 206 (7%) over last year. But the most interesting change in faculty demographics is the large increase in Canadian faculty sizes to 632 (see Table 18), up 65% compared with last year's number of 383. Recall that the response rate for Canadian schools was significantly higher this year compared with last (83% compared with 67%). However, in light of the significant increase in B.S. and M.S. student enrollment in Canada, we hope that this truly reflects an increase in Canadian faculty numbers (at least, for the sake of our Canadian sisters' sanity, we hope this is the case).

For the second year in a row, 13% of the new faculty hired into the tenure-track were women (Table 19), while 15% of the Ph.D. recipients (CS plus CE) were women (Table 2). The number of female professors remained stable at 16% for assistants, 12% for associates, and 8% for full. At this rate, it's going to take a very, very, very long time to attain gender equity. Significant ethnicity changes include a doubling of the number of African American full professors (from 2 to 4) and an increase (from 1 to 8) in the number of Native American assistant professors (see Table 22).

Faculty Salaries *(Tables 24-31)*

Average increases in salary levels at US institutions (CS only) ranged from 2.5% to 6.3%, with the smallest increase at the full professor level and the largest at the assistant professor level (Table 24). The increase at the assistant level is higher than last year, but the increase at the full professor level is slightly lower. Canadian salaries posted larger increases ranging from 5.4% for full professors to 9.6% at the assistant professor level (see Table 29). Salaries reported for US institutions are 9-month salaries reported in US dollars; those for Canadian institutions are 12-month salaries reported in Canadian dollars. The overall mean salaries reported in the center column in Tables 24 through 31 are unweighted means, calculated by averaging the mean salaries reported by each department. They are ***not*** weighted by the number of CS and CE faculty at each institution.

Average salaries for new tenure-track and researcher Ph.D.s in US CS and CE departments rose approximately 6%. On the other hand, average salaries for non-tenure teaching faculty and postdocs dropped 3.2% and 7.3%, respectively.

The salary figures in the first column of Table 25 that appear to be inverted are correct. This phenomenon was also observed last year.

Rankings

For tables that group computer science 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 schools in this ranking participated in the survey this year. One department declined to submit faculty salary information.

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. One department provided faculty salary data only.

CS departments ranked above 36 or unranked that responded to the survey include: Arizona State, Auburn, 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, Iowa State, Johns Hopkins, Kansas State, Kent State, Lehigh, Louisiana State, Michigan State, Michigan Technological, Mississippi State, Naval Postgraduate School, North Carolina State, North Dakota State, Northeastern, Northwestern, Oakland, Ohio State, Oklahoma State, Old Dominion, Oregon Graduate Institute, Oregon State, Pennsylvania State, Rensselaer Polytechnic Institute, Southern Methodist, State University of New York (Albany and Buffalo), Syracuse, Temple, Texas A&M, Texas Tech, Tufts, University of Alabama (Birmingham, Huntsville, and Tuscaloosa), University of California (Davis, Riverside, Santa Barbara, and Santa Cruz), Central Florida, Colorado (Boulder and Colorado Springs), Illinois (Chicago), Maryland (Baltimore Co.), Nebraska (Lincoln), Nevada (Las Vegas), South Florida, Southwestern Louisiana, Tennessee (Knoxville), Texas (Arlington, Dallas, and El Paso), Wisconsin (Milwaukee), Connecticut, Delaware, Denver, Florida, Hawaii, Houston, Idaho, Iowa, Kansas, Kentucky, Maine, Minnesota, Mississippi, New Hampshire, New Mexico, North Texas, Oklahoma, Oregon, Pittsburgh, South Carolina, Utah, Washington, 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: Northwestern, Purdue, Santa Clara, University of Cincinnati, and University of New Mexico.

Canadian departments participating in the survey include: Concordia, Dalhousie, McGill, Memorial, Queen's, Simon Fraser, Western Ontario, Alberta, British Columbia, Calgary, Manitoba, New Brunswick, Ottawa, Saskatchewan, Toronto (CS and ECE), Victoria, Waterloo, and York.

The following 18 departments that did not complete this year's survey did provide the number of Ph.D.s they produced in 1998-99: Boston, Brandeis, George Mason, George Washington, Montana State, New Jersey Institute of Technology, New Mexico State, New Mexico Tech, Polytechnic University, SUNY Binghamton, Stevens Institute of Technology, Tulane, Missouri (Columbia and Rolla), Georgia, Louisville, Tulsa, and Washington State.

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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.

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 were not computer engineers.

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Table 24. Nine-Month Salaries, 132 Responses of 155 US 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	429	$24,000	$43,439	$98,131	$48,609	$29,500	$55,226	$126,904
Assistant	600	$40,000	$61,065	$75,500	$64,244	$54,583	$67,995	$84,000
Associate	841	$42616	$65,767	$90,000	$72,177	$57,677	$80,286	$131,667
Full	1107	$45,600	$77,150	$109,650	$95,526	$63,400	$121,966	$239,135

Table 25. Nine-Month Salaries, 11 Responses of 12 US 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	59	$24,470	$56,943	$98,131	$65,273	$48,434	$74,082	$126,904
Assistant	84	$55,650	$64,992	$68,800	$69,414	$67,300	$74,435	$81,800
Associate	89	$51,050	$71,415	$90,000	$79,686	$77,570	$86,700	$95,000
Full	202	$45,600	$81,557	$93,300	$108,896	$130,000	$149,875	$180,000

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	46	$33,333	$48,010	$65,592	$57,296	$48,428	$68,229	$83,200
Assistant	54	$61,192	$65,576	$70,000	$69,546	$67,000	$75,091	$81,800
Associate	66	$61,811	$72,096	$82,000	$80,715	$80,200	$89,574	$101,750
Full	172	$66,818	$83,735	$109,650	$108,595	$130,000	$156,953	$239,135

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	28	$38,000	$49,904	$65,000	$56,036	$43,900	$63,467	$120,000
Assistant	75	$58,000	$64,248	$71,000	$67,301	$62,237	$71,040	$80,000
Associate	81	$60,810	$70,585	$83,400	$77,710	$70,000	$89,241	$131,667
Full	137	$67,574	$79,296	$92,383	$102,842	$96,678	$139,909	$190,000

Table 28. Nine-Month Salaries, 96 Responses of 120 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	296	$24,000	$40,470	$95,000	$44,693	$29,500	$50,478	$95,000
Assistant	387	$40,000	$59,593	$75,500	$62,538	$54,583	$65,911	$84,000
Associate	605	$42,616	$63,747	$87,000	$70,310	$57,667	$77,395	$104,700
Full	596	$52,898	$75,933	$100,000	$91,164	$63,400	$112,799	$235,000

Table 29. Twelve-Month Salaries, 19 Responses of 23 Canadian CS & CE 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	43	$35,500	$47,728	$70,000	$51,267	$39,008	$56,452	$83,696
Assistant	91	$46,640	$61,012	$80,916	$64,862	$51,728	$69,526	$90,725
Associate	139	$54,000	$67,755	$90,030	$77,109	$73,352	$87,161	$120,000
Full	190	$58,088	$79,781	$109,867	$95,766	$79,712	$118,756	$168,299

Table 30. Nine-Month Salaries for New Ph.D's, Responding US CS & 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	103	$42,000	$63,893	$83,000	$64,283	$55,000	$65,283	$83,000
Researcher	7	$40,200	$56,400	$82,000	$57,400	$48,000	$58,000	$62,000
Non-Tenure Teaching Faculty	13	$36,000	$50,555	$68,000	$50,861	$36,000	$51,000	$68,000
Postdoc	11	$25,000	$34,333	$44,000	$36,833	$35,000	$41,000	$55,000

Table 31. Nine-Month Salaries, 5 Responses of 24 US CE 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	3	$29,024	$39,675	$50,000	$39,675	$29,024	$39,675	$50,000
Assistant	26	$57,420	$60,606	$65,000	$62,942	$61,524	$66,713	$73,000
Associate	53	$60,543	$66,012	$71,300	$70,781	$74,619	$80,582	$89,500
Full	70	$66,393	$80,133	$91,000	$91,168	$94,988	$127,668	$150,500