2004-2005 Taulbee Survey

Ph.D. Production at an All-Time High with More New Graduates Going Abroad; Undergraduate Enrollments Again Drop Significantly

By Stuart Zweben

This article and the accompanying figures and tables present the results of the 35th 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. Responses received by January 9, 2006 are included in the analysis. The period covered by the data varies from table to table. Degree production and enrollment (Ph.D., Master's, and Bachelor's) refer to the previous academic year (2004-2005). Data for new students in all categories refer to the current academic year (2005-2006). Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2006.

The data were collected from Ph.D.-granting departments only. A total of 232 departments were surveyed, three more than last year. As shown in Figure 1, 188 departments returned their survey forms for a response rate of 81%. This is down slightly from last year's ten-year record of 83%, but is still quite comprehensive. The return rate of 10 out of 31 (32%) for CE programs is very low, as has been customary. Many CE programs are part of an Electrical and Computer Engineering (ECE) department and do not keep separate statistics for CE vs. EE. In addition, many of these departments are not aware of the Taulbee Survey or its importance. The response rate for US CS departments (156 of 174, or 90%) again was very good, and there was a good response rate (22 of 27, or 81%) from Canadian departments.

The set of departments responding varies slightly from year to year, even when the total numbers are about the same; thus, we must approach any trend analysis with caution. We must be especially cautious in using the data about CE departments because of the low response rate. However, we continue to report CE departments separately because there are some significant differences between CS and CE departments.

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. New features this year include some details about Ph.D. employment outside North America (Table 4), data about numbers of new graduate students from outside North America (Tables 5-1 and 13), information about gender and ethnicity of research faculty and postdocs (Tables 21 and 22), and data about part-time faculty (Table 22-1).

Departments that responded to the survey were sent preliminary results about faculty salaries in December 2005; these results included additional distributional information not contained in this report. The CRA Board views this as a benefit of participating in the survey.

We thank all respondents who completed this year's questionnaire. Departments that participated are listed at the end of this article.

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

During 2004-2005, a total of 1,189 Ph.D. degrees were awarded by the 188 responding departments (Table 1). This is an increase of more than 15% over last year, and represents the highest Ph.D. production reported in a single academic year in the history of the Taulbee Survey. The previous record of 1,113 was set in 1992.

Last year's prediction by the departments that 1,480 Ph.D. degrees would be awarded in 2004-2005 was, as usual, overly optimistic. However, the "optimism ratio," defined as the actual over the predicted, was 0.80, higher than last year's 0.76. Based on previous experiences, the departments' prediction of 1,599 graduates for next year is likely to

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Table 2. Gender of PhD Recipients by Type of Degree

	CS		CE		CS&CE	
Male	898	84.9%	100	89.3%	998	85.3%
Female	160	15.1%	12	10.7%	172	14.7%
Total have Gender Data for	**1,058**		**112**		**1,170**	
Unknown	13		6		19	
Total	**1,071**		**118**		**1,189**	

Table 3. Ethnicity of PhD Recipients by Type of Degree

	CS		CE		CS&CE	
Nonresident Alien	531	51.7%	73	70.2%	604	53.4%
African-American, Non-Hispanic	9	0.9%	3	2.9%	12	1.1%
Native American/ Alaskan Native	3	0.3%	0	0.0%	3	0.3%
Asian/Pacific Islander	112	10.9%	7	6.7%	119	10.5%
Hispanic	23	2.2%	0	0.0%	23	2.0%
White, Non-Hispanic	330	32.1%	20	19.2%	350	30.9%
Other/Not Listed	19	1.9%	1	1.0%	20	1.8%
Total have Ethnicity Data for	**1,027**		**104**		**1,131**	
Ethnicity/ Residency Unknown	44		14		58	
Total	**1,071**		**118**		**1,189**	

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%)
2003	148/170 (87%)	6/28 (21%)	19/27 (70%)	173/225 (77%)
2004	158/172 (92%)	10/30 (33%)	21/27 (78%)	189/229 (83%)
2005	156/174 (90%)	10/31 (32%)	22/27 (81%)	188/232 (81%)

Table 1. PhD Production by Type of Department and Rank

Department, Rank	PhDs Produced	Avg. per Dept.	PhDs Next Year	Avg. per Dept.	Passed Qualifier	Avg. per Dept.	Passed Thesis Ex. (# Depts)	Avg. per Dept.
US CS 1-12	231	21.0	262	23.8	265	24.1	153 (7)	21.9
US CS 13-24	147	12.2	191	15.9	281	23.4	156 (11)	14.2
US CS 25-36	129	10.8	177	14.8	189	15.8	119 (11)	10.8
US CS Other	522	5.2	742	6.2	1023	8.6	605 (98)	6.2
Canadian	112	5.1	152	6.9	209	9.5	165 (18)	9.2
US CE	48	6.9	75	7.5	92	9.2	42 (7)	6.0
Total	**1,189**	**6.4**	**1,599**	**8.6**	**2,059**	**11.1**	**1,240 (152)**	**8.2**

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yield an actual production in the neighborhood of 1,250. This still would result in another record crop of Ph.D.s.

The number of new students entering Ph.D. programs (Table 5) decreased from 2,887 to 2,749 (5%). This follows an 8% decrease last year and a 5% decrease the previous year. Again this year the decrease is entirely in the U.S. programs, whose new Ph.D. enrollments are down more than 7% (this statement is true even when the less reliable computer engineering data are removed from the U.S. totals). For the second straight year Canadian departments showed a 20% increase in new Ph.D. students. While last year the increase was due to the specific set of schools that reported (whereas individual departments mainly experienced *decreased* enrollments), this year there appears to be an increase in enrollment at most schools.

For the first time, we requested information about the number of new students who come from outside North America. Table 5-1 reports the data for the fall 2005 class. Top-ranked U.S. departments have a somewhat higher fraction of domestic students than do lower-ranked departments, and Canadian departments have a lower percentage of Ph.D. students from outside North America than do their U.S. counterparts. Trends from these data will not be visible for a while, but will be of interest to our community.

The number of students who passed qualifiers (Table 1) decreased during the past year from 2,318 to 2,059 (11%), which follows a 50% increase last year. On a per-department basis, the number passing qualifiers decreased from 12.3 to 11.1, but this still is well above the rate of 6.5 per department five years ago. The number who passed thesis proposal exams (Table 1) rose to 1,240 from 1,025 (21%), on the heels of a 16% increase last year. While the thesis proposal data in this table are less comprehensive than other data about the Ph.D. pipeline, they also suggest a continued increase in Ph.D. production for the short term. Total Ph.D. enrollment (Table 6) decreased slightly, from 14,234 to 13,958 (2%), following two consecutive years of increases in the neighborhood of 20%. If the decreases on the entrance end of the pipeline continue to balance or outweigh the increases at the exit, the increased production currently seen should end after a few years.

Figure 2. PhD **Production**

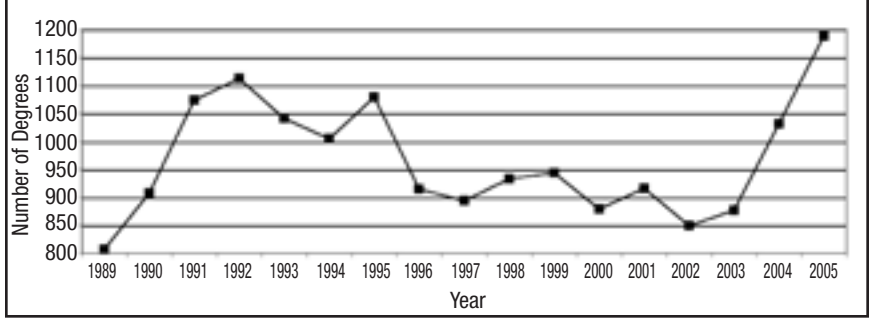

Table 4. Employment of New PhD Recipients By Specialty

	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	
North American PhD-Granting Depts.												
Tenure-track	34	15	1	6	34	19	22	15	20	13	**179**	17.5%
Researcher	10	1	3	1	5	7	7	4	3	4	**45**	4.4%
Postdoc	24	5	2	4	5	8	10	14	6	17	**95**	9.3%
Teaching Faculty	2	0	1	2	7	4	1	6	5	4	**32**	3.1%
											351	34.3%
North American, Other Categories												
Other CS/CE Dept.	12	6	1	5	9	8	9	9	9	4	**72**	7.0%
Non-CS/CE Dept.	3	2	2	0	3	1	2	2	1	1	**17**	1.7%
Industry	41	38	10	21	84	59	30	37	46	39	**405**	39.6%
Government	6	1	2	0	7	2	0	2	2	5	**27**	2.6%
Self-Employed	0	0	0	0	1	2	0	1	0	2	**6**	0.6%
Unemployed	4	0	0	1	1	0	3	3	1	2	**15**	1.5%
Other	0	0	0	0	2	0	1	2	1	4	**10**	1.0%
											552	53.9%
Outside North America												
Tenure-Track in PhD-Granting Depts.	6	1	1	3	6	5	4	2	4	6	**38**	3.7%
Researcher in PhD	3	0	0	1	1	0	2	0	0	0	**7**	0.7%
Postdoc in PhD	6	0	1	0	2	0	1	1	1	0	**12**	1.2%
Teaching in PhD	1	0	0	0	1	1	0	1	1	0	**5**	0.5%
Other Academic	2	0	0	1	2	0	1	0	2	1	**9**	0.9%
Industry	8	6	1	3	5	0	3	1	3	1	**31**	3.0%
Government	1	1	0	0	1	2	1	0	1	1	**8**	0.8%
Other	0	0	1	1	2	1	3	1	2	0	**11**	1.1%
											121	11.8%
Total in North America	**136**	**68**	**22**	**40**	**158**	**110**	**85**	**95**	**94**	**95**	**903**	88.2%
Total Outside North America	**27**	**8**	**4**	**9**	**20**	**9**	**15**	**6**	**14**	**9**	**121**	11.8%
Total have Employment Data for	163	76	26	49	178	119	100	101	108	104	**1,024**	100.0%
Unknown	9	3	1	2	18	8	9	12	9	94	**165**	
Total	**172**	**79**	**27**	**51**	**196**	**127**	**109**	**113**	**117**	**198**	**1,189**	

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Table 5. New PhD Students in Fall 2005 by Department Type and Rank

Department, Rank	CS				CE				CS&CE	
	New Admit	MS to PhD	Total	Avg. per Dept.	New Admit	MS to PhD	Total	Avg. per Dept.	Total	Avg. per Dept
US CS 1-12	336	18	354	32.2	0	0	0	0.0	354	32.2
US CS 13-24	239	33	272	22.7	7	9	16	1.3	288	24.0
US CS 25-36	264	25	289	24.1	0	0	0	0.0	289	26.3
US CS Other	1,074	257	1,331	11.2	121	32	153	1.3	1,484	12.2
Canadian	242	31	273	12.4	16	0	16	0.8	289	13.8
US CE	0	0	0	0.0	44	1	45	5.6	45	5.6
Total	**2,155**	**364**	**2,519**	13.5	**188**	**42**	**230**	1.2	**2,749**	**14.9**

Table 5-1. New PhD Students from Outside North America

Department, Rank	CS	CE	CS & CE	Total New	% Outside North America
US CS 1-12	170	0	170	354	48.0%
US CS 13-24	122	6	128	288	44.4%
US CS 25-36	162	0	162	289	56.1%
US CS Other	708	87	795	1,484	53.6%
Canadian	102	9	111	289	38.4%
US CE	0	31	31	45	68.9%
Total	**1,264**	**133**	**1,397**	**2,749**	50.8%
Total New	2,519	230	**2,749**		
% Outside North America	50.2%	57.8%	50.8%		

Table 6. PhD Degree Total Enrollment by Department Type and Rank

Department, Rank	CS		CE		CS&CE	
US CS 1-12	2,032	16.0%	0	0.0%	2,032	14.6%
US CS 13-24	1,644	13.0%	18	1.4%	1,662	11.9%
US CS 25-36	1,503	11.9%	0	0.0%	1,503	10.8%
US CS Other	6,266	49.5%	759	58.8%	7,025	50.3%
Canadian	1,222	9.6%	125	9.7%	1,347	9.7%
US CE	0	0.0%	389	30.1%	389	2.8%
Total	**12,667**		**1,291**		**13,958**	

Table 7. PhD Program Total Enrollment by Gender

	CS		CE		CS&CE	
Male	10,001	79.6%	1,061	82.5%	11,062	79.9%
Female	2,566	20.4%	225	17.5%	2,791	20.1%
Total have Gender Data for	**12,567**		**1,286**		**13,853**	
Unknown	100		5		105	
Total	**12,667**		**1,291**		**13,958**	

Figure 3 shows the longer-term trend of the number of CS Ph.D. graduates, normalized by the number of departments reporting to the Taulbee Survey. The figure also indicates the number of new students entering Ph.D. programs and the number of students who passed qualifiers. These also are normalized for the number of departments reporting. The graph offsets the qualifier data by one year from the data for new students, and offsets the graduation data by five years from the data for new students, to approximate the lag between student entrance into the pipeline and the qualifier and exit timeframe for the same cohort. This figure may be useful in predicting the timing of changes in Ph.D. production rates.

Table 4 shows employment for new Ph.D. recipients. Of those who reported employment, 43% took academic employment in North America (compared to 60% last year and 63% the year before). Most of these academic positions again were in Ph.D.-granting departments, and once again a smaller percentage went into tenure-track positions (17.5% vs. 27.5% last year and 34.2% the year before). There was a significant increase this year in the number who went to other CS/CE departments (72 vs. 31 in each of the past two years). Perhaps the increased total Ph.D. production, coupled with

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Figure 3. CS Pipeline corrected for year of entry

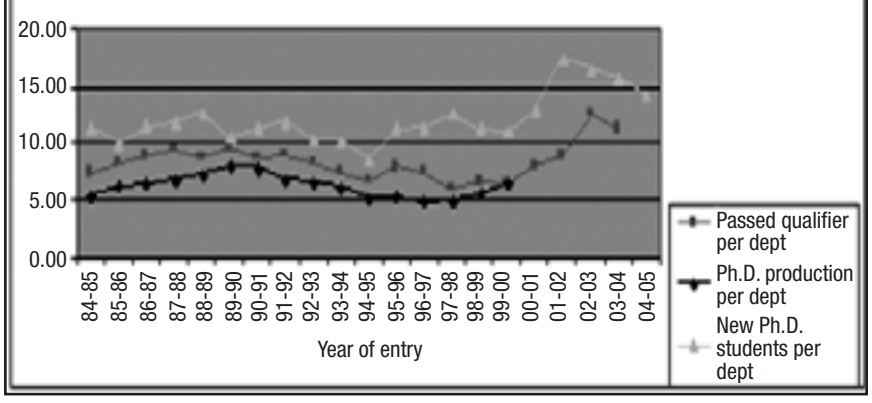

Figure 4. Employment of New Ph.D.s in U.S. and Canada

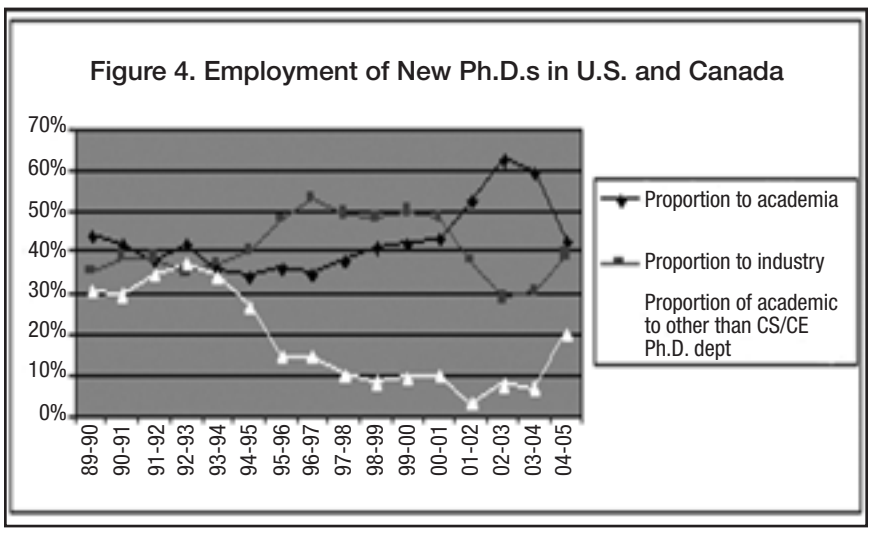

Figure 5. Nonresident Aliens as Fraction of Ph.D. Enrollments

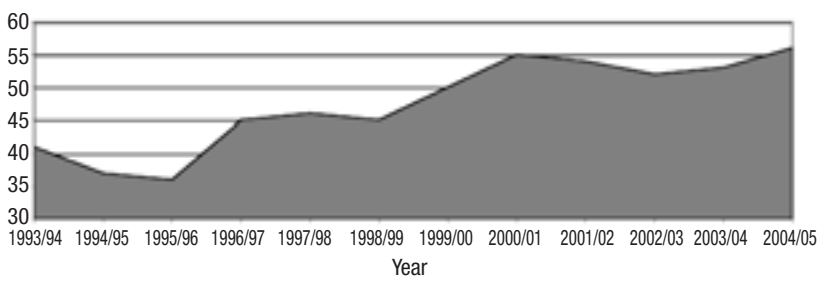

Figure 6. BS Production

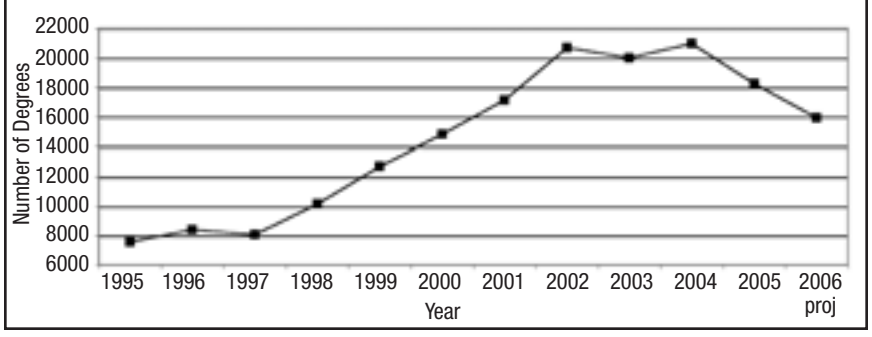

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Table 8. PhD Program Total Enrollment by Ethnicity

	CS		CE		CS&CE	
Nonresident Alien	6,295	53.7%	845	74.8%	7,140	55.6%
African-American, Non-Hispanic	160	1.4%	22	1.9%	182	1.4%
Native American/ Alaskan Native	33	0.3%	1	0.1%	34	0.3%
Asian/Pacific Islander	1,234	10.5%	39	3.5%	1,273	9.9%
Hispanic	131	1.1%	11	1.0%	142	1.1%
White, Non-Hispanic	3,663	31.2%	200	17.7%	3,863	30.1%
Other/Not Listed	206	1.8%	11	1.0%	217	1.7%
Total have Ethnicity Data for	**11,722**		**1,129**		**12,851**	
Ethnicity/Residency Unknown	945		162		1,107	
Total	**12,667**		**1,291**		**13,958**	

the modest growth rate of faculty in Ph.D.-granting departments (discussed later in this report), is making it possible for non-Ph.D.-granting CS/CE departments to obtain a larger share of the supply of new Ph.D.s.

This year there was a decrease (from 122 to 95) in the number of postdoctoral positions taken by new Ph.D.s. This is the opposite of the situation last year, and the number of new graduates taking postdoctoral positions this year is comparable to that of two years ago. Interestingly, the total number of postdocs in the academic departments (309, see Table 17) actually rose slightly (from 295 last year), suggesting a multi-year nature to most postdoctoral assignments.

Figure 4 shows the employment trend of new Ph.D.s to academia and industry, and the proportion of those going to academia who took positions in other than Ph.D.-granting CS/CE departments. During the past two years, the gap has been closed between those taking academic jobs and those taking industry jobs, as economic conditions in industry improve. The situation still is not what it was during the dot-com boom years when industry employment exceeded that of academia.

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

	Bachelor's						Master's					
	CS		CE		CS&CE		CS		CE		CS&CE	
Male	12,277	84.9%	2,548	87.6%	14,825	85.3%	6,175	74.5%	660	81.3%	6,835	75.1%
Female	2,186	15.1%	360	12.4%	2,546	14.7%	2,115	25.5%	152	18.7%	2,267	24.9%
Total have Gender Data for	**14,463**		**2,908**		**17,371**		**8,290**		**812**		**9,102**	
Unknown	674		187		861		176		8		184	
Total	**15,137**		**3,095**		**18,232**		**8,466**		**820**		**9,286**	

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

	Bachelor's						Master's					
	CS		CE		CS&CE		CS		CE		CS&CE	
Nonresident Aliens	1,082	9.9%	233	10.0%	1,315	9.9%	3,790	50.7%	414	56.9%	4,204	51.2%
African-American, Non-Hispanic	358	3.3%	106	4.5%	464	3.5%	151	2.0%	14	1.9%	165	2.0%
Native American/ Alaskan Native	31	0.3%	8	0.3%	39	0.3%	27	0.4%	3	0.4%	30	0.4%
Asian/Pacific Islander	2,279	20.9%	435	18.6%	2,714	20.5%	1,094	14.6%	79	10.9%	1,173	14.3%
Hispanic	479	4.4%	96	4.1%	575	4.3%	152	2.0%	11	1.5%	163	2.0%
White, Non-Hispanic	6,482	59.5%	1,406	60.2%	7,888	59.6%	2,112	28.2%	197	27.1%	2,309	28.1%
Other/Not Listed	189	1.7%	53	2.3%	242	1.8%	156	2.1%	9	1.2%	165	2.0%
Total have Ethnicity Data for	**10,900**		**2,337**		**13,237**		**7,482**		**727**		8,209	
Ethnicity/Residency Unknown	4,237		758		**4,995**		984		93		1,077	
Total	**15,137**		**3,095**		**18,232**		**8,466**		**820**		9,286	

Table 11. Bachelor's Degree Candidates for 2005-2006 by Department Type and Rank

Department, Rank	CS		CE		CS&CE	
US CS 1-12	1,414	10.7%	183	6.8%	1,597	10.0%
US CS 13-24	995	7.5%	259	9.6%	1,254	7.9%
US CS 25-36	1,495	11.3%	0	0.0%	1,495	9.4%
US CS Other	6,630	50.1%	1,413	52.4%	8,043	50.5%
Canadian	2,599	19.7%	253	9.4%	2,852	17.9%
US CE	88	0.7%	586	21.8%	674	4.2%
Total	**13,221**		**2,694**		**15,915**	

Table 12. Master's Degree Candidates for 2005-2006 by Department Type and Rank

Department, Rank	CS		CE		CS&CE	
US CS 1-12	767	10.4%	80	13.1%	847	10.6%
US CS 13-24	909	12.4%	6	1.0%	915	11.5%
US CS 25-36	499	6.8%	0	0.0%	499	6.3%
US CS Other	4,289	58.4%	367	59.9%	4,656	58.5%
Canadian	884	12.0%	55	9.0%	939	11.8%
US CE	2	0.0%	105	17.1%	107	1.3%
Total	**7,350**		**613**		**7,963**	

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Table 13. New Master's Students in Fall 2005 by Department Type and Rank

Department, Rank	CS Total	CS Avg. per Dept.	CE Total	CE Avg. per Dept.	CS&CE		Outside North America Total	Outside North America %
US CS 1-12	555	50.5	45	4.1	600	54.5	255	42.5%
US CS 13-24	712	59.3	6	0.5	718	59.8	369	51.4%
US CS 25-36	316	26.3	0	0.0	316	26.3	203	64.2%
US CS Other	3,161	26.6	255	2.1	3,416	28.7	1,605	47.0%
Canadian	744	32.3	67	2.9	811	35.3	288	35.5%
US CE	2	0.2	88	8.8	90	9.0	45	50.0%
Total	**5,490**		**461**		**5,951**	**31.8**	2,765	46.5%

Table 14. New Undergraduate Students in Fall 2005 by Department Type and Rank

Department, Rank	CS Pre-Major	CS Major	CS Avg. Major per Dept.	CE Pre-Major	CE Major	CE Avg. Major per Dept.	CS&CE Majors Major	CS&CE Majors Avg. Major per Dept.
US CS 1-12	192	834	69.5	3	152	25.3	986	82.2
US CS 13-24	125	533	48.5	0	200	28.6	733	66.6
US CS 25-36	251	1,107	123.0	0	0	0.0	1,107	123.0
US CS Other	2,208	5,478	51.2	1,013	1,257	21.3	6,735	62.9
Canadian	350	2,002	100.1	63	420	46.7	2,422	121.1
US CE	54	31	31.0	148	518	51.8	549	54.9
Total	**3,180**	**9,985**		**1,227**	**2,547**		**12,532**	**74.2**

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

Department, Rank	CS		CE		CS&CE	
US CS 1-12	1,276	6.9%	73	5.0%	1,349	6.7%
US CS 13-24	1,795	9.7%	7	0.5%	1,802	9.0%
US CS 25-36	684	3.7%	0	0.0%	684	3.4%
US CS Other	12,105	65.3%	853	58.3%	12,958	64.8%
Canadian	2,650	14.3%	219	15.0%	2,869	14.3%
US CE	25	0.1%	311	21.3%	336	1.7%
Total	**18,535**		**1,463**		**19,998**	

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

Department, Rank	CS Pre-Major	CS Major	CS Avg. Major per Dept.	CE Pre-Major	CE Major	CE Avg. Major per Dept.	CS&CE Majors Total	CS&CE Majors Avg. Major per Dept.
US CS 1-12	330	4,227	352.2	0	492	70.3	4,719	393.3
US CS 13-24	229	3,287	273.9	0	1,065	152.1	4,352	362.7
US CS 25-36	520	4,379	437.9	0	0	0.0	4,379	437.9
US CS Other	5,167	28,690	256.2	1,411	5,138	85.6	33,828	302.0
Canadian	442	15,684	746.9	202	1,225	136.1	16,909	805.2
US CE	132	183	183.0	252	2,026	202.6	2,209	220.9
Total	**6,820**	**56,450**	**318.9**	**1,865**	**9,946**	**56.2**	**66,396**	**375.1**

Despite increased Ph.D. production, the proportion of new graduates who are reported as unemployed is a very low 1.5% and the proportion reported as "employment unknown" is similar to that of earlier years. However, the proportion (11.8%) of Ph.D. graduates who were reported taking positions outside North America, among those whose employment is known, is considerably greater than at any time since the mid-90s (it was 4.5% last year, and ranged from 3.0% to 5.4% during the past eight years). This is the first evidence within the Taulbee Survey that globalization and offshoring is moving new graduates of Ph.D. programs away from the United States and Canada. It should be noted, however, that this survey question was changed this year to request more detailed information, and therefore some part of the reported increase in employment outside North America may be due to response differences.

The data in Table 4 also indicate the areas of specialty of new CS/CE Ph.D.s. Year-to-year fluctuations among these data are common. Multi-year trends are difficult to discern, though during the past decade the AI/robotics and programming languages/compiler areas generally have been on a declining trend, while the graphics/HCI area generally has been on an increasing trend.

The proportion of women among new Ph.D.s dropped from 18.0% in 2004 to 14.7% in 2005 (Table 2). The proportion of nonresident alien Ph.D.s rose from 48.2% in 2004 to 53.4% in 2005 (Table 3). There was an offsetting drop in the proportion of white, non-Hispanic and Asian/Pacific Islanders. African-American, Native-American/Alaskan Native, and Hispanics collectively accounted for only 3.4% of the total, up slightly from 2.6% last year. The difference is mainly attributable to an increase in the proportion of Hispanics.

Current Ph.D. enrollment proportions are almost the same this year as last. However, there is a slight increase in the proportion of nonresident aliens in the Ph.D. programs (55.6% vs. 52.8% last year), and a slight decrease in the proportion of Asian/Pacific Islanders. This is despite the reports of declining applications from abroad to Ph.D. programs, at least in the United States. African-American and Hispanic proportions remain dismal, in the 1% to 2% range, and the proportion of Native Americans is even lower.

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

Master's degree production (Tables 9, 10) totaled 9,286 students, a decrease of 6% (following an increase of 8% the previous year). This is reasonably consistent with the 8% drop in new Master's students two years ago. There also was a 17% drop in new Master's students reported in last year's survey. There was very little difference in gender and ethnicity characteristics of Master's recipients compared to last year's survey. Actual Master's degrees awarded exceeded last year's projections by only 10%, compared to a 21% underestimate the previous year. This year's enrollment figures for Master's programs (Table 13) are about 2.5% greater than those of last year, while expected Master's production (Table 12) is 5% to 6% below last year's expectations. As we did with new Ph.D. students, this year we are able to report (Table 13) the count and proportion of new Master's students coming from outside North America. Among the 36 top-ranked U.S. departments the same trend noted among new Ph.D. students was observed, with top departments having a greater proportion of new domestic Master's students than lower-ranked departments. However, this trend was not evident for departments not ranked in the top 36. Canadian departments had a smaller proportion of non-North American new Master's students than did their U.S. counterparts, consistent with the observations for new Ph.D. students.

There were 18,232 Bachelor's degrees awarded in 2004-05 (Tables 9 and 10), a 13% decrease compared to last year (following last year's 5% increase that was explained totally by the additional number of departments reporting compared to the previous year).

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2004-2005 Taulbee Survey

Table 17. Actual and Anticipated Faculty Size by Position

	Actual	Projected		Expected Two-Year Growth	
	2005-2006	2006-2007	2007-2008		
Tenure-Track	4,532	4,766	4,947	415	9.2%
Researcher	426	486	538	112	26.3%
Postdoc	309	368	424	115	37.2%
Teaching Faculty	728	747	828	100	13.7%
Other/Not Listed	105	108	115	10	9.5%
Total	**6,100**	**6,475**	**6,852**	**752**	**12.3%**

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

	Actual	Projected		Expected Two-Year Growth	
	2005-2006	2006-2007	2007-2008		
US CS 1-12	749	782	810	61	8.1%
US CS 13-24	552	605	643	91	16.5%
US CS 25-36	524	568	608	84	16.0%
US CS Other	3,130	3,329	3,493	363	11.6%
Canadian	961	982	1,070	109	11.3%
US CE	184	208	229	45	24.5%
Total	**6,100**	**6,474**	**6,853**	**753**	**12.3%**

Table 19. Gender of Newly Hired Faculty

	Tenure-track		Researcher		Postdoc		Teaching Faculty		Total	
Male	175	78.8%	31	77.5%	72	81.8%	37	68.5%	315	78.0%
Female	47	21.2%	9	22.5%	16	18.2%	17	31.5%	89	22.0%
Total	**222**		**40**		**88**		**54**		**404**	

Graduation figures are now starting to reflect the results of the significantly decreased enrollments in our undergraduate programs that have been observed in the past two surveys and reported widely in the media. On top of the decreased overall production, there was a decreasing proportion of female Bachelor's degrees, from 17.0% in 2003-04 to 14.7% in 2004-05. There also was an increase, from 54.4% to 59.6%, in the proportion of white, non-Hispanics receiving Bachelor's degrees, and a slight decrease in the proportion of Asian/Pacific Islanders receiving these degrees. These statistics indicate a continuing, and even increasing, diversity problem within our discipline.

Actual Bachelor's degree production in departments reporting this year was below the projection from last year's reporting departments by more than 7%. Projected Bachelor's production for this year (Table 11) would forecast another 13% decrease, which is believable given the continued drop in enrollment.

The number of new undergraduate majors dropped another 21%, from 15,950 to 12,532 (see Table 14 and Figure 7). This follows last year's 10% drop in new majors and a 23% drop the year before that. Accounting for the fact that more departments are reporting to the survey now than did three years ago, we effectively have seen a halving of the number of new majors entering our programs over a three-year period. Total enrollment in Bachelor's programs (Table 16) is down nearly 14% from last year and 30% compared to three years ago.

The number of new pre-majors in computer science is once again down considerably from last year (24%, following a 20% drop last year), although the number of pre-majors in computer engineering rose by 21% this year. Because computer science programs dominate our survey, the net effect of these two changes is a decrease of 15% in total pre-major counts. It therefore is likely that the decreases in the number of undergraduate majors, at least in our computer science programs, will continue for another year.

Faculty Demographics *(Tables 17-23)*

Total faculty sizes continued to grow, at a 3% rate during the past year. Almost all of this increase is due

Table 20. Ethnicity of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching Faculty		Total
Nonresident Alien	54	25.8%	9	25.0%	40	48.8%	7	14.0%	**110**
African-American, Non-Hispanic	4	1.9%	0	0.0%	1	1.2%	0	0.0%	**5**
Native American/ Alaskan Native	0	0.0%	0	0.0%	0	0.0%	0	0.0%	**0**
Asian/Pacific Islander	55	26.3%	8	22.2%	14	17.1%	6	12.0%	**83**
Hispanic	3	1.4%	0	0.0%	0	0.0%	0	0.0%	**3**
White, Non-Hispanic	91	43.5%	19	52.8%	27	32.9%	37	74.0%	**174**
Other/Not Listed	2	1.0%	0	0.0%	0	0.0%	0	0.0%	**2**
Total have Ethnicity Data for	**209**		**36**		**82**		**50**		**377**
Ethnicity/Residency Unknown	13		4		6		4		**27**
Total	**222**		**40**		**88**		**54**		**404**

Table 21. Gender of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Male	1,724	90.2%	1,117	87.5%	1,127	82.7%	542	73.3%	325	84.2%	239	83.3%	**5,074**	**85.1%**
Female	187	9.8%	159	12.5%	236	17.3%	197	26.7%	61	15.8%	48	16.7%	**888**	**14.9%**
Total	**1,911**		**1,276**		**1,363**		**739**		**386**		**287**		5,962	

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Table 22. Ethnicity of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Nonresident Alien	13	0.8%	29	2.6%	216	18.2%	21	3.1%	43	13.4%	117	45.3%	**439**	8.4%
African-American, Non-Hispanic	7	0.4%	12	1.1%	23	1.9%	11	1.6%	0	0.0%	3	1.2%	**56**	1.1%
Native American/ Alaskan Native	3	0.2%	3	0.3%	2	0.2%	0	0.0%	0	0.0%	0	0.0%	**8**	0.2%
Asian/Pacific Islander	361	21.8%	231	20.9%	316	26.6%	54	8.1%	44	13.8%	46	17.8%	**1,052**	20.2%
Hispanic	21	1.3%	20	1.8%	25	2.1%	17	2.5%	2	0.6%	5	1.9%	**90**	1.7%
White, Non-Hispanic	1,225	73.9%	799	72.3%	590	49.7%	547	81.8%	227	70.9%	75	29.1%	**3,463**	66.6%
Other/Not Listed	27	1.6%	11	1.0%	16	1.3%	19	2.8%	4	1.3%	12	4.65%	**89**	1.7%
Total Have Ethnicity Data For	**1,657**		**1,105**		**1,188**		**669**		**320**		**258**		**5,197**	
Ethnicity/ Residency Unknown	254		171		175		70		66		29		**765**	
Total	**1,911**		**1,276**		**1,363**		**739**		**386**		**287**		**5,962**	

Table 22-1. Part-Time Faculty

	Total
Full Professor	76
Associate Professor	26
Assistant Professor	28
Teaching Faculty	295
Research Faculty	19
Postdoctorate	6
Total	450

Table 23. Faculty Losses

	Total
Died	8
Retired	56
Took Academic Position Elsewhere	61
Took Nonacademic Position	39
Remained, but Changed to Part-Time	16
Other	25
Unknown	8
Total	**213**

Table 24-1. Total Expenditure from External Sources for CS/CE Research

Department, Rank	Total Expenditure			
	Minimum	Mean	Median	Maximum
US CS 1-12	$2,100,000	$19,558,466	$12,727,000	$81,813,953
US CS 13-24	$4,864,064	$9,698,921	$8,888,557	$16,455,614
US CS 25-36	$476,139	$5,654,788	$4,228,057	$14,882,518
US CS Other	$29,216	$2,435,166	$1,835,071	$16,976,756
Canadian	$81,885	$2,841,403	$2,253,827	$7,582,696
US CE	$319,449	$2,466,187	$2,567,185	$5,732,972

Making Waves

Grace Hopper Celebration of Women in Computing

2006 Conference

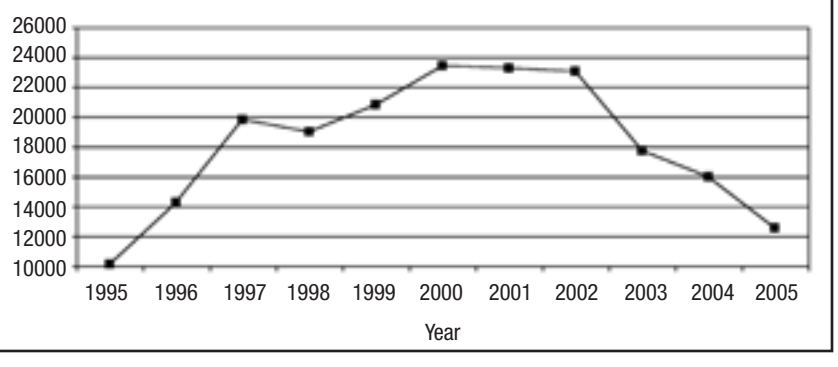
October 4-7, 2006—San Diego, California

Details: http://www.gracehopper.org/

Table 24-2. Per Capita Expenditure from External Sources for CS/CE Research by Department Rank and Type

Department, Rank	Per Capita Expenditure (Tenure-Track Faculty Only)				Per Capita Expenditure (Tenure-Track, Research, and Postdoctorate Faculty)			
	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	Maximum
US CS 1-12	$105,000	$390,215	$353,024	$1,038,248	$72,414	$300,890	$284,886	$608,187
US CS 13-24	$151,497	$327,558	$315,954	$806,170	$130,601	$246,914	$203,912	$571,037
US CS 25-36	$25,060	$167,700	$190,824	$311,111	$22,673	$137,601	$141,013	$246,940
US CS Other	$2,679	$118,205	$93,324	$679,070	$2,679	$103,185	$86,933	$585,405
Canadian	$2,641	$72,480	$68,432	$164,841	$2,641	$65,056	$62,062	$135,405
US CE	$19,310	$227,028	$112,538	$796,246	$18,667	$177,445	$111,617	$562,056

Figure 7. Newly Declared CS/CE Undergraduate Majors



to the 4% growth in tenure-track faculty, the dominant category. Other faculty categories are relatively flat compared to last year.

Table 4 shows 351 new Ph.D. graduates known to have taken faculty positions at CS/CE Ph.D.-granting departments. Tables 19 and 20 indicate that a total of 404 persons were hired during the past year. Thus, over 85% of the faculty hires made this past year by Ph.D.-granting CS/CE departments appear to have been new Ph.D.s (about 10% higher than last year), with the rest a combination of faculty who changed academic position, persons joining academia from government and industry, new Ph.D.s from outside of North America and from disciplines outside of CS/CE, and non-Ph.D.-holders (e.g., taking a teaching faculty appointment). As was the case last year, the fraction of tenure-track hires who were new Ph.D.s appears to be over 80% (179 new Ph.D.s taking tenure-track faculty positions at Ph.D.-granting programs, and 222 new tenure-track faculty members hired by these programs).

This year's 3% growth in total faculty size falls short of the 6% growth predicted by departments in last year's survey. After two

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

Department, Rank	Number on Institutional Funds										Number on External Funds									
	Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other		Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other	
US CS 1-12	354	18.6%	393	20.6%	130	6.8%	0	0.0%	18	0.9%	0	0.0%	823	43.2%	169	8.9%	0	0.0%	18	0.9%
US CS 13-24	262	18.5%	232	16.4%	105	7.4%	14	1.0%	11	0.8%	0	0.0%	768	54.2%	20	1.4%	0	0.0%	4	0.3%
US CS 25-36	298	24.7%	65	5.4%	49	4.1%	4	0.3%	6	0.5%	1	0.1%	728	60.4%	40	3.3%	0	0.0%	15	1.2%
US CS Other	1,806	36.1%	599	12.0%	149	3.0%	63	1.3%	55	1.1%	73	1.5%	2,101	42.0%	111	2.2%	16	0.3%	26	0.5%
Canadian	606	45.1%	439	32.6%	17	1.3%	15	1.1%	49	3.6%	9	0.7%	123	9.1%	83	6.2%	0	0.0%	4	0.3%
US CE	66	20.6%	21	6.6%	16	5.0%	4	1.3%	2	0.6%	0	0.0%	202	63.1%	7	2.2%	0	0.0%	2	0.6%
Total	**3,392**	30.3%	**1,749**	15.6%	**466**	4.2%	**100**	0.9%	**141**	1.3%	**83**	0.7%	**4,745**	42.4%	**430**	3.8%	**16**	0.1%	**69**	0.6%

Table 26-1. Fall 2005 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Teaching Assistantships				Research Assistantships			
	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	Maximum
US CS 1-12	$9,600	$15,570	$15,516	$19,238	$14,814	$17,846	$16,900	$25,800
US CS 13-24	$14,396	$19,013	$17,746	$30,166	$11,991	$19,782	$18,333	$35,326
US CS 25-36	$11,947	$15,353	$14,300	$21,174	$13,724	$16,052	$15,176	$21,366
US CS Other	$1,000	$13,261	$13,455	$26,100	$1,300	$14,234	$14,256	$26,100
Canadian	$3,500	$9,926	$9,800	$18,000	$5,100	$14,353	$14,242	$22,500
US CE	$1,672	$12,723	$14,750	$17,160	$1,527	$14,712	$15,800	$19,500

Table 26-2. Fall 2005 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Full-Support Fellows				Assistantships for Computer Systems Support			
	Minimum	Mean	Median	Maximum	Minimum	Mean	Median	Maximum
US CS 1-12	$16,328	$19,151	$18,875	$25,800	*	*	*	*
US CS 13-24	$4,750	$18,783	$18,166	$30,000	$15,908	$22,602	$18,368	$37,764
US CS 25-36	$13,814	$17,216	$16,624	$25,000	*	*	*	*
US CS Other	$1,001	$17,911	$16,682	$60,000	$1,150	$11,974	$12,000	$26,100
Canadian	$12,500	$23,316	$21,000	$40,000	$11,806	$17,935	$20,000	$22,000
US CE	$1,944	$16,432	$18,375	$24,000	*	*	*	*

*Numbers not reported due to low number of respondents

Table 26-3. Fall 2005 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Other Assistantships			
	Minimum	Mean	Median	Maximum
US CS 1-12	$14,737	$20,279	$19,100	$27,000
US CS 13-24	$1,642	$15,109	$18,148	$22,500
US CS 25-36	*	*	*	*
US CS Other	$1,001	$10,515	$9,500	$22,992
Canadian	$1,125	$7,159	$6,000	$14,570
US CE	*	*	*	*

*Numbers not reported due to low number of respondents

consecutive years of good predictions in this regard, over-optimism has crept back in. Thus, this year's prediction of 6% growth in total faculty size should be viewed with an appropriate degree of realism.

Table 23 on faculty "losses" shows an increase, from 75 last year to 103 (though less than 2% of all faculty), in the number who left academia this past year through death, retirement, or taking nonacademic positions. The retirement number went from 45 to 56. The amount of "churn," the number of professors moving from one academic position to another, dropped from 87 to 61.

The percentage of newly hired women faculty rose to 22% from 17% last year. This compares favorably with the 15% proportion of new female Ph.D.s shown in Table 2. A similar situation is noted when considering only new tenure-track faculty hires. The percentage of newly hired postdoctoral students who are women rose to 18% this year from 15% last year.

Ethnicity data for newly hired faculty, in general, mirror the trends in the production of new Ph.D.s relative to the various ethnicity categories. The proportion of white, non-Hispanic hires decreased, while the proportion of nonresident aliens increased. However, the proportion of Asian/Pacific Islanders hired increased, while the proportion receiving Ph.D.s decreased. As has been observed for the past few years, disproportionally fewer nonresident aliens are being hired into tenure-track faculty positions (26%) compared to nonresident aliens' proportion of the new Ph.D.s produced (53.4%). The increased proportion of new Ph.D.s taking jobs abroad (reported earlier) no doubt is contributing to the widening of this gap from previous years.

This year, Tables 21 and 22 also show gender and ethnicity data of current research faculty and postdocs. Also new this year is Table 22-1, which reports data on part-time faculty.

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

Table 24-1 shows the department's total expenditure (including indirect costs or "overhead" as stated on project budgets) from external sources of support. Table 24-2 shows the per capita expenditure, where capitation is computed two ways. The first is relative to the number of tenured and tenure-track faculty members, which also was the method used prior to last year's survey. The second is relative to researchers and postdocs as well as tenured and tenure-track faculty. The higher the ranking, the more external funding is received by the department (both in total and per capita). Canadian levels are shown in Canadian dollars.

The data show some interesting and perhaps surprising features this year. Mean and median expenditures, both in total and on a per capita basis (no matter which capitation method is used), actually declined for the U.S. top 12 departments and for departments ranked 25-36. Double-digit percent decreases were frequent among these groups. Means and median expenditures for departments ranked 13-24 and Canadian schools typically showed double-digit increases in total and per capita (though the maximum value among the Canadian schools declined),

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Table 27. Nine-month Salaries, 156 Responses of 174 US CS Computer Science Departments

Faculty Rank, Tenured and Tenure-Track	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full Professor	1,475	$68,757	$95,805	$140,996	$118,401	$115,376	$86,832	$154,800	$402,773
Associate Professor	973	$44,850	$81,176	$129,000	$91,131	$90,993	$69,353	$101,668	$161,490
Assistant Professor	1,076	$43,024	$77,077	$109,250	$82,303	$82,144	$69,870	$87,360	$141,833
Non-Tenure-Track									
Teaching Faculty	593	$22,000	$51,392	$110,705	$60,880	$60,246	$24,000	$71,646	$163,000
Research Faculty	271	$24,000	$61,544	$115,000	$74,947	$72,034	$30,000	$94,278	$200,000
Postdoctorates	185	$24,000	$44,145	$75,000	$47,817	$47,404	$24,000	$52,618	$80,000

Table 28. Nine-month Salaries, 10 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
Full Professor	237	$87,200	$102,486	$125,900	$135,260	$130,574	$150,960	$200,716	$229,500
Associate Professor	74	$71,000	$89,246	$115,800	$100,778	$101,728	$90,023	$110,505	$140,000
Assistant Professor	112	$58,800	$81,021	$94,500	$87,847	$87,182	$88,859	$94,671	$105,000
Non-Tenure-Track									
Teaching Faculty	70	$24,303	$54,811	$80,793	$76,723	$77,443	$69,945	$100,078	$163,000
Research Faculty	66	$60,000	$74,601	$82,800	$102,379	$102,627	$81,000	$130,580	$200,000
Postdoctorates	58	$25,000	$49,175	$61,900	$55,052	$54,929	$51,500	$61,529	$75,700

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
Full Professor	212	$84,600	$99,785	$115,250	$142,685	$136,035	$168,199	$212,691	$402,773
Associate Professor	80	$69,697	$91,146	$107,100	$103,401	$103,486	$97,613	$115,781	$155,333
Assistant Professor	90	$63,900	$84,836	$109,250	$90,669	$89,596	$86,465	$99,018	$141,833
Non-Tenure-Track									
Teaching Faculty	40	$53,503	$66,132	$85,428	$74,860	$77,404	$65,849	$84,901	$104,976
Research Faculty	58	$42,755	$72,737	$115,000	$94,400	$91,248	$49,992	$128,427	$200,000
Postdoctorates	33	$31,500	$41,405	$56,649	$47,078	$46,487	$40,513	$55,068	$80,000

while departments ranked greater than 36 showed increases in total expenditures and median capitation expenditures, but decreases in mean capitation expenditures (with a large decrease in the maximum capitation expenditures). Computer engineering expenditures generally declined, though the median of total expenditures rose slightly. These mixed reports suggest that it has become harder for faculty to obtain and/or sustain funding for computing research in the U.S. CRA has reported on the funding story extensively through the years, and these data are consistent with the declining state of research funding that has been noted recently.

Table 25 shows the number of graduate students supported as full-time students as of fall 2005, further categorized as teaching assistants, research assistants, fellows, or computer systems supporters, and split between those on institutional vs. external funds. All categories of departments in the U.S. showed decreases in the number of teaching assistants (with higher-ranked departments showing the largest decreases), while Canadian departments showed increases. This is the first year where the U.S. figures show a consistent story in teaching assistant employment, and likely reflects the decreased demands in the undergraduate programs within these departments.

The support for research assistants is somewhat mixed. Top 12 departments showed a considerable decline (over 20%) in the number of externally supported research assistants, but this was somewhat offset by an increase in the number of research assistants supported on institutional funds. This pattern is consistent with the decline in research funding discussed above. In total, these departments supported 13.5% fewer research assistants compared to last year's survey. The number of full-support fellows declined by a similar amount.

For departments ranked 13-24, there were fewer externally funded research assistants and full-support fellows this year, but sufficiently more institutionally supported persons in these categories to compensate. It is interesting that external support of students declined for these departments although external research funding had increased last year. This may result from the different time periods reflected in these two sets of data. External funding covers the most recently completed fiscal year, while the student support data are for the fall 2005 term.

Departments ranked 25-36 reported a significant increase in the number of externally funded research assistants, offset slightly by a decline in the number of institutionally supported research assistants. This is surprising in view of the decline in externally funded research for these departments. The number of full-support fellows for these departments held steady during the past year.

Departments ranked greater than 36 showed increased numbers of research assistants receiving support from both external and institutional sources, with some offsetting decreases in the number of full-support fellows in both categories.

Canadian schools reported a significant increase in the number of full-support fellows. Institutionally supported research assistants also increased greatly, while externally supported research assistants declined by a comparable amount. Computer engineering departments reported a significant decline in externally funded research assistants. However, the small number of such programs and their frequent combination with electrical engineering programs within these departments make these data less reliable.

Respondents were asked to "provide the net amount (as of fall 2005) of an academic-year stipend for a first-year doctoral student (not including tuition or fees)." The results are shown in Table 26. Canadian stipends are shown in Canadian dollars. Again this year, some median values increased while others decreased compared to last year's report. In strata showing a decrease, it appears to be because some departments within the stratum reported this information one year and not the other. With the exception of departments ranked 13-24, where median salaries for teaching assistants rose more than 7%, any increases in graduate student salaries were modest.

Faculty Salaries *(Tables 27-34)*

Each department was asked to report individual (but anonymous) faculty salaries if possible; otherwise,

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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
Full Professor	178	$70,250	$96,355	$123,000	$127,839	$125,002	$128,905	$171,300	$200,613
Associate Professor	98	$66,131	$84,128	$129,000	$95,100	$95,513	$89,445	$105,770	$129,000
Assistant Professor	108	$59,060	$78,738	$84,000	$84,081	$84,254	$82,602	$88,253	$95,310
Non-Tenure-Track									
Teaching Faculty	56	$41,660	$55,992	$80,808	$68,961	$65,894	$63,900	$86,132	$141,050
Research Faculty	44	$25,000	$52,311	$84,075	$68,188	$62,115	$59,500	$90,295	$140,400
Postdoctorates	30	$25,000	$40,548	$60,000	$43,807	$43,646	$35,568	$48,214	$69,100

Table 31. Nine-month Salaries, 122 Responses of 138 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
Full Professor	848	$68,757	$94,795	$140,996	$113,583	$111,081	$86,832	$143,534	$263,135
Associate Professor	721	$44,850	$79,263	$110,000	$88,744	$88,389	$69,353	$99,162	$161,490
Assistant Professor	766	$43,024	$75,817	$100,000	$80,826	$80,780	$69,870	$85,511	$126,659
Non-Tenure-Track									
Teaching Faculty	427	$22,000	$48,868	$110,705	$57,084	$56,587	$24,000	$66,242	$125,000
Research Faculty	103	$24,000	$59,606	$112,356	$68,857	$66,253	$30,000	$83,481	$194,670
Postdoctorates	64	$24,000	$44,570	$75,000	$47,199	$46,698	$24,000	$50,744	$75,000

Table 32. Nine-month Salaries, 10 Responses of 31 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
Full Professor	77	$60,000	$90,950	$114,300	$115,607	$111,649	$85,048	$157,281	$201,036
Associate Professor	43	$54,288	$78,900	$101,470	$86,323	$85,555	$81,458	$94,969	$112,556
Assistant Professor	53	$68,472	$78,852	$94,900	$81,831	$81,547	$75,530	$85,106	$95,400
Non-Tenure-Track									
Teaching Faculty	10	$48,840	$58,237	$70,191	$64,391	$62,073	$50,000	$72,885	$114,839
Research Faculty	7	*	*	*	*	*	*	*	*
Postdoctorates	11	$31,044	$38,104	$57,375	$40,837	$40,804	$31,044	$43,504	$57,375

Table 33. Twelve-month Salaries, 22 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
Full Professor	304	$60,000	$101,632	$137,011	$123,840	$120,924	$106,416	$159,780	$311,797
Associate Professor	225	$61,600	$87,428	$121,820	$100,338	$99,746	$88,288	$115,244	$146,594
Assistant Professor	227	$44,816	$78,179	$115,876	$87,189	$87,065	$67,474	$95,042	$124,181
Non-Tenure-Track									
Teaching Faculty	84	$24,600	$63,231	$95,460	$74,493	$75,243	$54,810	$84,456	$117,802
Research Faculty	11	$42,000	$50,833	$62,000	$55,404	$54,167	$42,000	$63,505	$81,515
Postdoctorates	32	$22,800	$29,400	$36,000	$41,616	$40,447	$40,000	$55,371	$74,600

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

Employment Position	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track Faculty	99	$69,000	$79,913	$103,889	$80,197	$80,194	$70,000	$80,485	$103,889
Non-Tenure-Track									
Researcher	10	$28,980	$52,042	$80,100	$52,931	$52,931	$28,980	$53,820	$80,100
Postdoc	10	$24,000	$60,850	$80,000	$60,850	$60,850	$24,000	$60,850	$80,000
Non-Tenure Teaching Faculty	48	$25,000	$45,951	$75,000	$47,925	$47,983	$27,000	$49,629	$75,000

Table 34a. Nine-month Salaries for New PhDs, Responding Canadian Departments

Employment Position	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Tenure-Track Faculty	10	$61,142	$81,587	$93,000	$81,814	$81,814	$64,308	$82,040	$93,000

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the department was requested to provide the minimum, median, mean, and maximum salaries for each rank (full, associate, and assistant professors and non-tenure-track teaching faculty) and the number of persons at each rank. The salaries are those in effect on January 1, 2006. For U.S. departments, nine-month salaries are reported in U.S. dollars. For Canadian departments, twelve-month salaries are reported in Canadian dollars. Respondents were asked to include salary supplements such as salary monies from endowed positions.

Here we report tables comparable to those used in previous Taulbee surveys. The tables contain data about ranges and measures of central tendency only. Those departments reporting individual salaries were provided more comprehensive distributional information in December 2005. A total of 162 departments (86% of those reporting salary data) provided salaries at the individual level.

The minimum and maximum of the reported salary minima (and maxima) are self-explanatory. The range of salaries in a given rank among departments that reported data for that rank is the interval ["minimum of the minima," "maximum of the maxima"]. The mean of the reported salary minima (maxima) in a given rank is computed by summing the departmental reported minimum (maximum) and dividing by the number of departments reporting data at that rank.

The median salary at each rank is the middle of the list if you order its members' mean salaries at that rank from lowest to highest, or the average of the middle two numbers if there is an even number of items in the set. The average salary at each rank is computed by summing the individual means reported at each rank and dividing by the number of departments reporting at that rank. We recognize that these means and medians are only approximations to the true means and medians for their rank.

Overall U.S. CS average salaries (Table 27) increased between 3.7% and 4.1%, depending on tenure-track rank, and 4.8% for non-tenure-track teaching faculty. These increases compare favorably with the 2.5% to 3.3% levels experienced last year for tenure-track faculty and the 4.0% level for non-tenure-track teaching faculty. Departments ranked 13-24 gave the highest average increases at the assistant and full professor level (5.4% each), while departments not ranked in the top 36 gave the highest increases to associate professors (4.0%). Canadian salaries (shown as 12-month salaries in Canadian dollars) rose 3.1% to 4.4% with the greater increase at the full professor rank and the smaller at the assistant professor rank.

Median salaries for new Ph.D.s (those who received their Ph.D. last year and then joined departments as tenure-track faculty) increased 3.4% from those reported in last year's survey (Table 34). This level of increase is more in line with the average increases for continuing faculty, after two years of very small increases for new Ph.D.s.

Concluding Observations

As predicted last year, our field is producing Ph.D.s at a record rate, and the short-term forecast is for continued record production. While there is no evidence in our employment statistics that the increased production is resulting in an inability of Ph.D. graduates to find work, an increasing fraction of new Ph.D.s appear to be taking positions outside of North America. In the wake of accelerating globalization of the marketplace, this is not surprising.

Three consecutive years of decreasing numbers of new Ph.D. students, and a sharply reduced pipeline at the Bachelor's level, will make it difficult to sustain this production rate in the longer term. Moreover, it is not yet clear when the decline in our undergraduate program enrollments will end. The double-digit percent decrease in bachelor's production observed this year is likely to continue for the next several years. Coupled with the declining representation of women in our undergraduate programs, our ability to produce a workforce that is sufficiently educated technically to meet the needs of the job market in computing is being severely challenged. The declining enrollments at the Bachelor's level also will increasingly challenge the ability of CS/CE departments to grow their faculty as they desire.

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 [see http://www.cra.org/statistics/nrcstudy2/home.html].

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 University, Brandeis, Case Western Reserve, City University of New York Graduate Center, 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, Michigan State, Michigan Technological, Mississippi State, Montana State, Naval Postgraduate School, New Mexico State, North Carolina State, North Dakota State, Northeastern, Northwestern, Nova Southeastern, Ohio, Ohio State, Oklahoma State, Old Dominion, Oregon State, Pace, Pennsylvania State, Polytechnic, Portland State, Rensselaer Polytechnic, Southern Methodist, State University of New York (Albany and Binghamton), Stevens Institute of Technology, Syracuse, Texas A&M, Texas Tech, Toyota Technological Institute (Chicago), Tufts, Vanderbilt, Virginia Polytechnic, Washington State, Washington (St. Louis), Wayne State, West Virginia, Western Michigan, Worcester Polytechnic, and Wright State.*

University of: *Alabama (Birmingham and Tuscaloosa), Arkansas (Little Rock), Buffalo, 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, Houston, Illinois (Chicago), Iowa, Kansas, Kentucky, Louisiana (Lafayette), Maine, Maryland (Baltimore Co.), Massachusetts (at Boston and Lowell), Minnesota, Mississippi, Missouri (at Columbia, Kansas City and Rolla), Nebraska (Lincoln and Omaha), Nevada (Las Vegas and Reno), New Hampshire, New Mexico, North Carolina (Charlotte), North Texas, Notre Dame, Oklahoma, Oregon, Pittsburgh, South Carolina, South Florida, Tennessee (Knoxville), Texas (at Arlington, Dallas, El Paso, and San Antonio), Toledo, Tulsa, Utah, Wisconsin (Milwaukee) and Wyoming.*

Computer Engineering departments participating in the survey this year include: *Georgia Institute of Technology, Northwestern, Princeton, Purdue, Rensselaer Polytechnic, and the Universities of Tennessee (Knoxville), California (Santa Cruz), Central Florida, Houston, and Southern California.*

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

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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.
3. 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.
4. All ethnicity tables: Ethnic breakdowns are drawn from guidelines set forth by the U.S. Department of Education.
5. 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. ■

CRA Welcomes New Members

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McMaster University (CE&S)

Union College (CS)

Lab/Center Members

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