Computing Degree and Enrollment Trends

From the 2007-2008 CRA Taulbee Survey

Undergraduate Enrollment in Computer Science Trends Higher;

Doctoral Production Continues at Peak Levels

By Stuart Zweben

Executive Summary

Summary of Results

- Total enrollment per department by majors and pre-majors in U.S. computer science programs is up 6.2 percent over last year. If only majors are considered, the increase is 8.1 percent. This is the first increase in total enrollment in computer science programs in six years.

- The average number of new undergraduate students per department in U.S. computer science programs is up 1.7 percent over last year. If only majors are considered, the increase is 9.5 percent.

- Bachelor's degree production in computer science was down 10 percent this year, compared to a nearly 20 percent decline last year.

- Diversity in computer science undergraduate programs remains poor. The fraction of Bachelor's degrees awarded to women held steady at 11.8 percent this year. As was the case last year, nearly two-thirds of those receiving bachelor's degrees were White, non-Hispanics.

- Total Ph.D. production among the responding departments grew to 1,877 for the period between July 2007 and June 2008. This represents a 5.7 percent increase over last year.

Introduction

The *CRA Taulbee Survey*[1] is conducted annually by the Computing Research Association to document trends in student enrollment, degree production, employment of graduates, and faculty salaries in Ph.D.-granting departments of computer science (CS) and computer engineering (CE) and information (I)[2] in the United States and Canada. This article and the accompanying figures and tables present the enrollment and degree production results from the 38th annual *CRA Taulbee Survey*. The full report, which also includes information about faculty size, demographics and salaries, graduate student support, and research expenditures, will be available in May 2009 at www.cra.org.

Information for the survey is gathered from CRA's member institutions during the Fall of each year. Responses received by January 5, 2009 are included in this years' 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 (2007-2008). Data for new students in all categories refer to the current academic year (2008-2009).

For this report, we surveyed a total of 264 Ph.D.-granting departments. Included in this count are 19 I-school departments, which were surveyed for the first time. Of the 264 departments surveyed, 192 departments returned their survey forms, for a response rate of 73 percent. This is down from last year's 79 percent, but is still quite comprehensive (see Table 1) and is negatively influenced by the 47 percent response rate from the new I departments and the typical low response rate (38 percent) from CE programs. We had a good response rate from U.S. CS departments (151 of 183, or 83 percent), and a reasonable response rate (20 of 30, or 67 percent) from Canadian departments, although the response rate in both U.S. CS and Canadian departments was lower this year than last year.

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[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] Information (I) programs included here are Information Science, Information Systems, Information Technology, Informatics, and related disciplines with a strong computing component. In fall 2008, the first year these programs were surveyed as part of Taulbee, surveys were sent to CRA members, the CRA IT Deans group members, and participants in the iSchools Caucus (www.ischools.org) who met the criteria of granting Ph.D.s and being located in North America.

The survey form itself is modified slightly each year to ensure a high rate of return (e.g., by simplifying and clarifying), while continuing to capture the data necessary to understand trends in the discipline and also reflect changing concerns of the computing research community. In addition to including I departments, this year's survey modified the specialty areas within the Ph.D. (see Table 9 and the accompanying discussion). The ethnicity categories also were modified to conform to those used by the National Center for Educational Statistics.

Departments that responded to the survey were sent preliminary results about faculty salaries in December 2008; 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.

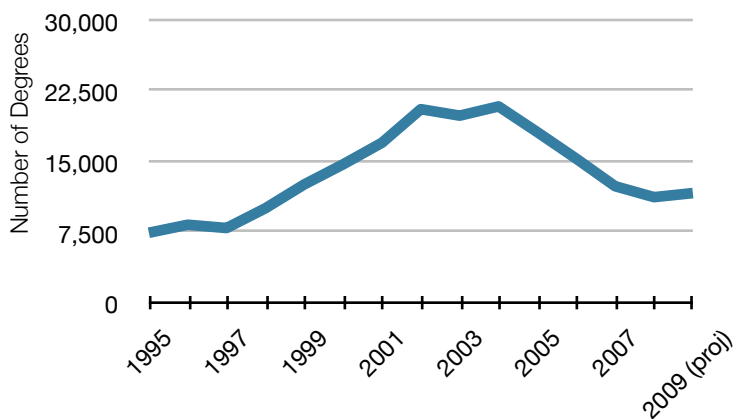| Table 1. Number of Respondents to the Taulbee Survey				
Year	**US CS Depts.**	**US CE Depts.**	**Canadian**	**US I-Schools**	**Total**
1995	110/133 (83%)	9/13 (69%)	11/16 (69%)		130/162 (80%)
1996	98/131 (75%)	8/13 (62%)	9/16 (56%)		115/160 (72%)
1997	111/133 (83%)	6/13 (46%)	13/17 (76%)		130/163 (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%)
2006	156/175 (89%)	12/33 (36%)	20/28 (71%)		188/235 (80%)
2007	155/176 (88%)	10/30 (33%)	21/28 (75%)		186/234 (79%)
2008	151/183 (83%)	12/32 (38%)	20/30 (67%)	9/19 (47%)	192/264 (73%)

Bachelor's Degree Production and Enrollments

Bachelor's degree production (Figure 1) in CS was down 10 percent this year, compared to a nearly 20 percent decline last year. The slowing of the decl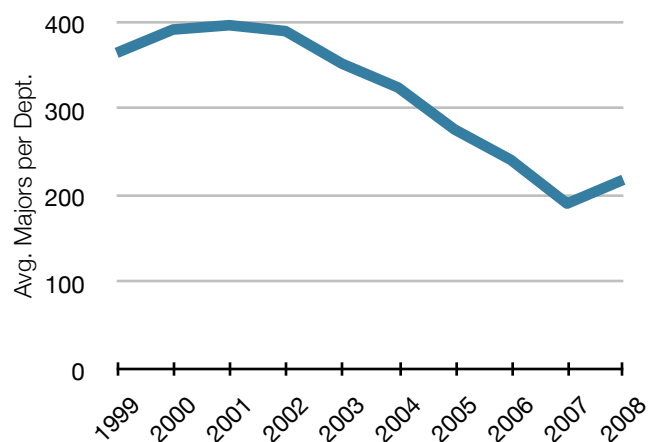ine in degree production is consistent with an increase in overall enrollment in U.S. CS programs. The average number of new students per department in U.S. CS programs is up 1.7 percent over last year, and if only majors are considered, the increase is 9.5 percent (however, the latter number is influenced by departments who no longer use pre-majors and hence all of their new students now are counted as majors). During the last three years, the cumulative increase in average number of new students per department is 9.4 percent, and is 15.8 percent if only majors are considered.

Figure 1. BS Production (CS & CE)

Furthermore, some of the CS departments who now are able to report l majors reported these majors among their CS majors in previous years. So the number of CS majors this year actually grew even more than is represented in the tabulated data. It definitely appears that U.S. CS departments are replenishing the freshman and sophomore ranks with larger groups than they are graduating as seniors. Total enrollment per department by majors and pre-majors in U.S. CS programs is up 6.2 percent over last year, and if only majors are considered, the increase is 8.1 percent. This is the first increase in total enrollment in CS programs in six years. We should see this reflected in bachelor's degree production soon.

New CS student data is similar in Canadian

Figure 2. BS Total Enrollment - Avg. Majors per US CS Dept.

schools, though total Canadian CS enrollment is lower for both majors and pre-majors this year. As mentioned at the beginning of this report, the Canadian data is much more sensitive to the particular departments that responded to the survey, although this also could just be a reflection that Canadian departments are a year or so behind U.S. CS departments in realizing the turnaround.

Diversity in our undergraduate programs remains poor. The fraction of Bachelor's degrees awarded to women held steady at a paltry 11.8 percent this year (Table 2). As was the case last year, nearly two-thirds of those receiving bachelor's degrees were White, non-Hispanics (Table 3).

Table 2. Gender of Bachelor's Recipients								
	CS		CE		I		Total	
Male	7,939	88.2%	1,839	89.3%	1,263	86.3%	11,041	88.2%
Female	1,061	11.8%	221	10.7%	201	13.7%	1,483	11.8%
Total with Gender Data	9,000		2,060		1,464		12,524	
Unknown	217		62		12		291	
Total	9,217		2,122		1,476		12,815	

Table 3. Ethnicity of Bachelor's Recipients								
	CS		CE		I		Total	
Nonresident Alien	423	6.2%	154	8.3%	60	4.2%	637	6.3%
American Indian or Alaska Native	56	0.8%	7	0.4%	6	0.4%	69	0.7%
Asian	998	14.7%	368	19.8%	205	14.3%	1,571	15.5%
Black or African-American	273	4.0%	100	5.4%	118	8.2%	491	4.9%
Native Hawaiian or Pacific Islander	54	0.8%	10	0.5%	1	0.1%	65	0.6%
White	4,483	65.8%	1,073	57.6%	922	64.4%	6,478	64.1%
Multiracial, not Hispanic	108	1.6%	0	0.0%	2	0.1%	110	1.1%
Resident Hispanic, any race	414	6.1%	151	8.1%	117	8.2%	682	6.8%
Total with Ethnicity Data	6,809		1,863		1,431		10,103	
Resident, race/ethnicity unknown	1,125		125		30		1,280	
Residency unknown	1,283		134		15		1,432	
Total	9,217		2,122		1,476		12,815	

Master's Degree Production and Enrollments

Master's degree production in CS and CE was negligibly different from last year, although there was a slight decline in CS and an increase in CE. The large number of master's degrees in I departments and I degrees from CS departments added considerably to the total count of degrees awarded from the departments responding to this year's survey. This year, the master's degree production numbers are displayed by department type and rank (Table 4). Curiously, the prediction of the number of CS Master's degrees to be awarded in 2008-09 is higher than it was last year, while the enrollment in CS master's programs is slightly lower. However, last year the departments did a poor job predicting the number of CS master's degree recipients (5,883 predicted last year, and 7,383 awarded). So the increased prediction of 6,394 this year (Table 5) appears to be justified.

Table 4. Master's Degree Recipients by Department Type and Rank								
Department, Rank	**CS**		**CE**		**I**		**Total**	
US CS 1-12	735	10.0%	45	5.5%	0	0.0%	780	7.8%
US CS 13-24	1,181	16.0%	0	0.0%	0	0.0%	1,181	11.8%
US CS 25-36	460	6.2%	1	0.1%	56	3.1%	517	5.2%
US CS Other	4,343	58.8%	548	67.3%	684	38.0%	5,575	55.8%
Total US CS	6,719	91.0%	594	73.0%	740	41.1%	8,053	80.5%
US CE	0	0.0%	149	18.3%	9	0.5%	158	1.6%
US Information	0	0.0%	3	0.4%	1,052	58.4%	1,055	10.6%
Canadian	664	9.0%	68	8.4%	0	0.0%	732	7.3%
Total	**7,383**		**814**		**1,801**		**9,998**	

The fraction of CS Master's degrees awarded to women was down slightly compared to last year's survey. In 2007-08, 21.2 percent of the degrees went to women, while the previous year 22.7 percent went to women. The CE numbers were within one-half of one percent of the previous year's data. Note that I departments awarded 49 percent of their master's degrees to women (Table 6). The ethnicity of I department master's graduates also is more diverse than in CS or CE departments (Table 7). In CS and CE departments, there is a slight increase in the fraction of

graduates who are nonresident aliens, and a corresponding decrease in those who are Asian or Native Hawaiian/Pacific Islander.

Table 5. Master's Degree Candidates for 2008-2009 by Department Type and Rank								
Department, Rank	CS		CE		I		Total	
US CS 1-12	743	11.6%	75	8.6%	0	0.0%	818	9.3%
US CS 13-24	1,070	16.7%	2	0.2%	0	0.0%	1,072	12.2%
US CS 25-36	588	9.2%	2	0.2%	84	5.4%	674	7.6%
US CS Other	3,462	54.1%	530	60.9%	592	38.1%	4,584	52.0%
Total US CS	5,863	91.7%	609	70.0%	676	43.5%	7,148	81.1%
US CE	0	0.0%	216	24.8%	7	0.5%	223	2.5%
US Information	0	0.0%	4	0.5%	872	56.1%	876	9.9%
Canadian	531	8.3%	41	4.7%	0	0.0%	572	6.5%
Total	**6,394**		**870**		**1,555**		**8,819**	

Table 6. Gender of Master's Recipients								
	CS		CE		I		Total	
Male	5,565	78.8%	636	78.1%	919	51.0%	7,120	73.6%
Female	1,500	21.2%	178	21.9%	882	49.0%	2,560	26.4%
Total with Gender Data	**7,065**		**814**		**1,801**		**9,680**	
Unknown	318		0		0		318	
Total	**7,383**		**814**		**1,801**		**9,998**	

| Table 7. Ethnicity of Master's Recipients								
	CS		CE		I		Total	
Nonresident Alien	3,469	55.8%	420	57.1%	380	22.7%	4,269	49.5%
American Indian or Alaska Native	14	0.2%	17	2.3%	7	0.4%	38	0.4%
Asian	665	10.7%	56	7.6%	197	11.7%	918	10.6%
Black or African-American	110	1.8%	14	1.9%	109	6.5%	233	2.7%
Native Hawaiian or Pacific Islander	14	0.2%	0	0.0%	0	0.0%	14	0.2%
White	1,783	28.7%	211	28.7%	915	54.6%	2,909	33.7%
Multiracial, not Hispanic	32	0.5%	0	0.0%	6	0.4%	38	0.4%
Resident Hispanic, any race	129	2.1%	18	2.4%	63	3.8%	210	2.4%
Total with Ethnicity Data	**6,216**		**736**		**1,677**		**8,629**	
Resident, race/ethnicity unknown	655		38		91		784	
Residency unknown	512		40		33		585	
Total	**7,383**		**814**		**1,801**		**9,998**	

Ph.D. Degree Production, Enrollments and Employment

Total Ph.D. production among the responding departments grew to 1,877 for the period between July 2007 and June 2008 (Figure 3). This represents a 5.7 percent increase over last year. However, it includes 77 who graduated with I degrees. Nearly all I degree graduates would not have been counted in previous years (though a small number may have been reported among CS department graduates). Subtracting the I degree graduates yields a total of 1,800 for a 1.4 percent increase over last year. This year's production of more than 1,800 is well below the nearly 2,000 predicted last year. The "optimism ratio," defined as the actual number divided by the predicted number, was 0.90, as opposed to last year's 0.95. If this year's optimism ratio holds again next year, there will be approximately 1,900 new Ph.D.s produced in 2008-09. However, it also may be that we are about at a peak production rate. Changing hiring conditions resulting from the weak economy also may delay graduation for some Ph.D. students.

The number of new students passing thesis candidacy exams (most, but not all, departments have such exams) rose 7 percent, although more departments reported such exams this year. When the I departments are subtracted, the increase is only 4 percent. On a per department basis, the numbers are down slightly, whether I departments are included or not. The number of students

Figure 3. Total Ph.D. Production (CS & CE, US and Canada)
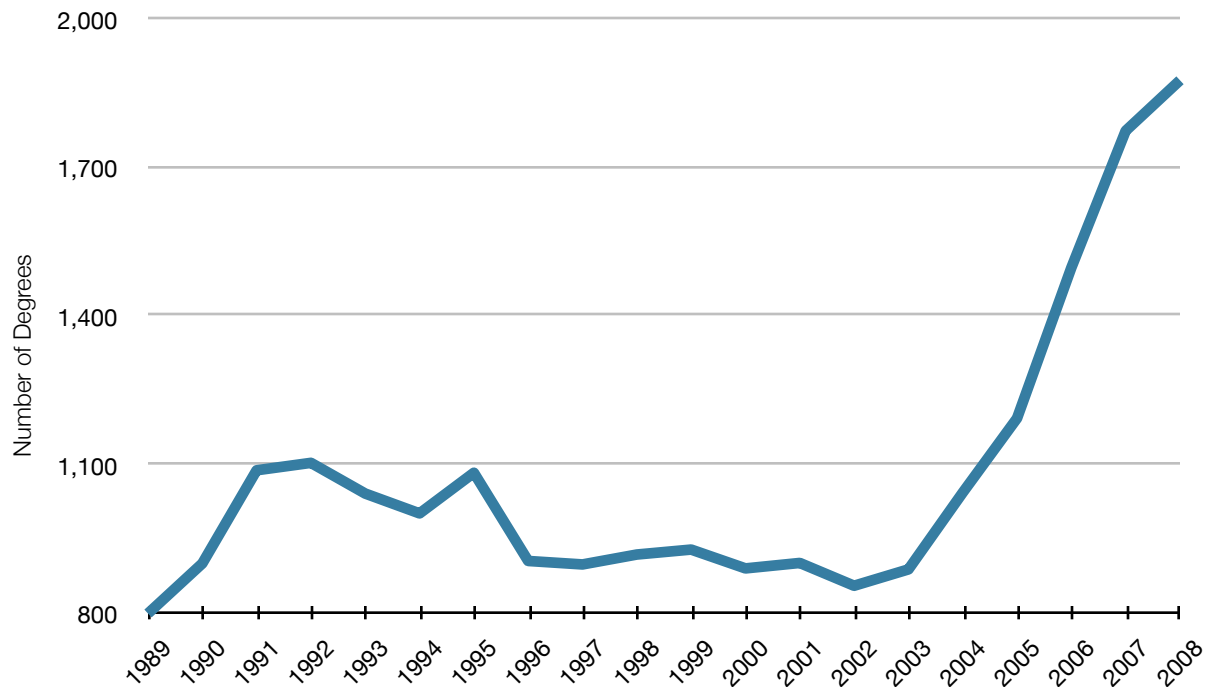
passing the qualifier also rose significantly (13 percent), to its level of two years ago if I departments are included. Without I departments, the increase still was a healthy 9 percent.

The total number of new CS Ph.D. students rose by 10 percent, following a 4 percent increase last year. This year, the increase was due to the admission of a larger class of new students, while last year it was due to Master's students becoming Ph.D. students. More departments reported new student data this year, so the 10 percent increase is somewhat misleading. The number of new CS Ph.D. students per department reporting actually is almost the same this year as it was last year. Figure 4 shows a graphical view of the pipeline for computer science programs. The data in this graph are normalized by 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. These data have been useful in estimating the timing of changes in production rates. They suggest that we have peaked in CS Ph.D. production for a few years, and expect a slight decline during the next couple of years. However, the turnaround in the number of students who passed qualifiers makes longer term trends difficult to forecast.

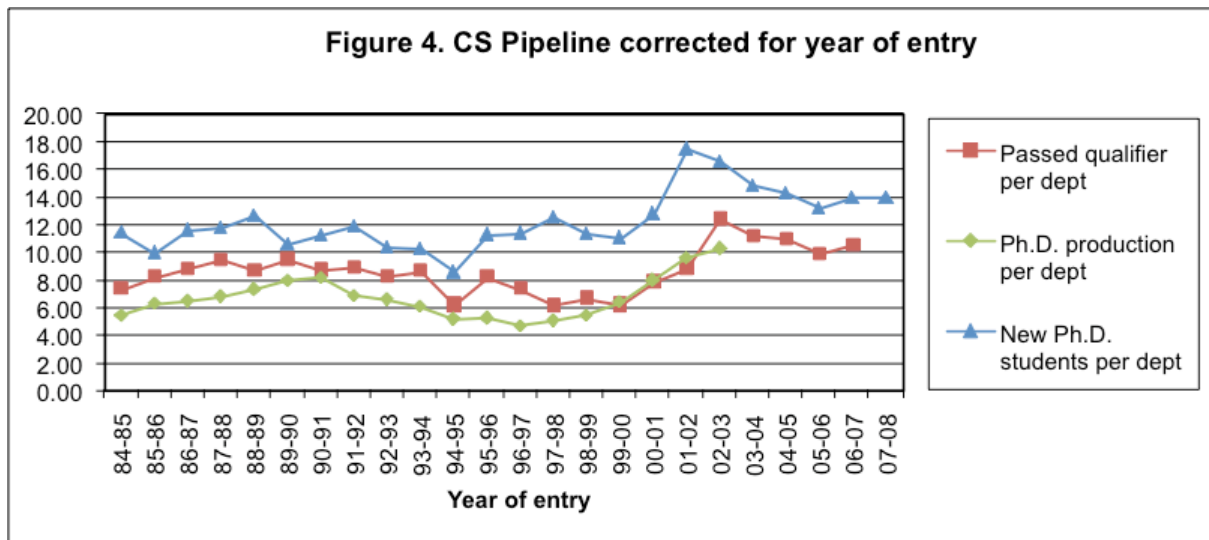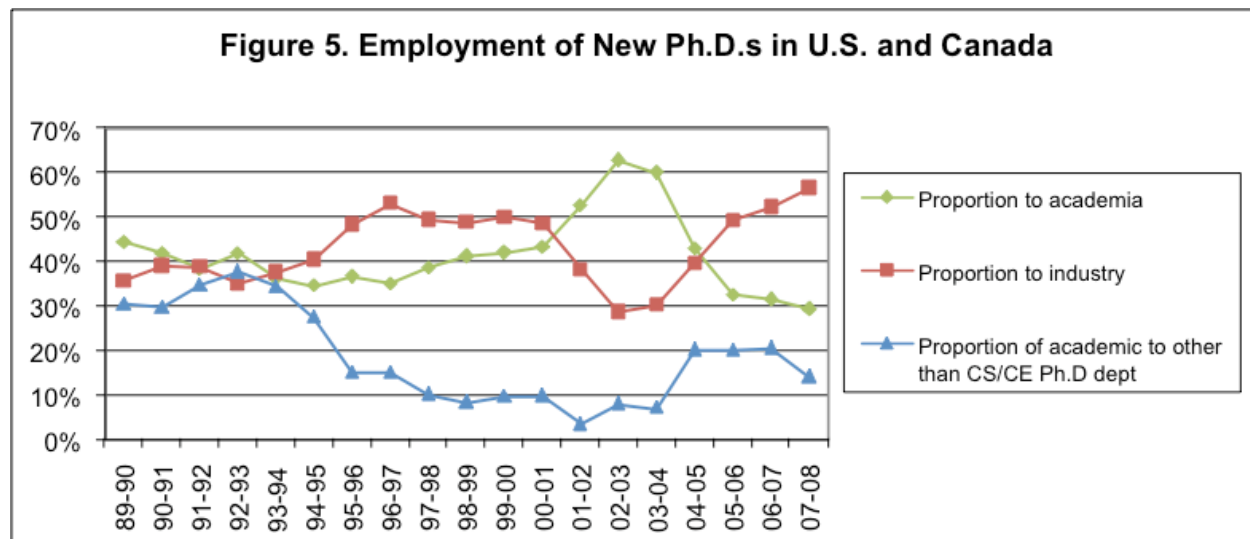Figure 4. CS Pipeline corrected for year of entry

Table 8 reports the data for new students in fall 2008 from outside North America. Top 12 U.S. departments continue to have a somewhat higher fraction of domestic students than do lower-ranked departments, and Canadian departments continue to have a lower percentage of Ph.D. students from outside North America than do their U.S. counterparts. The range of new Ph.D. students in U.S. programs who are not North American is 50 percent to 64 percent across the ranking strata. I departments are at the lower end of this range. Among U.S. programs ranked 25-36, the fraction of new Ph.D. students from outside North America increased from 59 percent to 64 percent. In Canadian programs, the fraction of new students who were not North American declined from 43 percent to 36 percent. Overall, the fraction of non North American new Ph.D. students (54.0 percent) is comparable to last year's 54.8 percent.

Figure 5 shows the employment trend of new Ph.D.s in academia and industry, and the proportion of those going to academia who took positions in departments other than Ph.D.-granting CS/CE departments. Table 9 shows a more detailed breakdown of the employment data for new Ph.D.s The trend toward employment in industry over academia continues for the 2007-08 Ph.D. graduates. Of those for whom employment type is known, industry hired 56.6 percent of new Ph.D. graduates, compared to 52.3, 49.4 and 39.6 percent in the previous three years. In contrast, about 30 percent took academic employment in North America (compared to 32, 33, 43 and 60 percent, respectively, in the previous four years). There also is a continued decline in the

Table 8. New PhD Students from Outside North America						
Department, Rank	CS	CE	I	Total New Outside	Total New	% Outside North America
US CS 1-12	201	0	1	**202**	407	49.6%
US CS 13-24	169	0	0	**169**	300	56.3%
US CS 25-36	209	5	17	**231**	360	64.2%
US CS Other	735	83	20	**838**	1,521	55.1%
Total US CS	1,314	88	38	**1,440**	2,588	55.6%
US CE	0	48	0	**48**	66	72.7%
US Information	0	0	37	**37**	72	51.4%
Canadian	101	3	0	**104**	291	35.7%
Total	**1,415**	**139**	**75**	**1,629**	3,017	54.0%
Total New	2,615	239	163	3,017		
% Outside	54.1%	58.2%	46.0%	54.0%		

Figure 5. Employment of New Ph.D.s in U.S. and Canada

Legend:
- Proportion to academia
- Proportion to industry
- Proportion of academic to other than CS/CE Ph.D dept

percentage that went into tenure-track positions in Ph.D.-granting programs (9.4 percent vs 11.4 , 12.8, 17.5 and 27.5 percent in the previous four years) and to non-Ph.D.-granting CS/CE departments (4.2 percent vs. 4.7, 5.2 and 7.0 percent in the previous three years). The decline in the number of persons going into tenure-track positions in Ph.D.-granting programs is almost exactly offset by an increase in the number of new Ph.D.s going to postdoctoral positions.

Table 9. Employment of New PhD Recipients By Specialty

	Artificial Intelligence	Computer-Supported Cooperative Work	Databases / Information Retrieval	Graphics/Visualization	Hardware/Architecture	Human-Computer Interaction	High-Performance Computing	Informatics: Biomedical/ Other Science	Information Assurance/Security	Information Science	Information Systems	Networks	Operating Systems	Programming Languages/ Compilers	Robotics/Vision	Scientific/ Numerical Computing	Social Computing/ Social Informatics	Software Engineering	Theory and Algorithms	Other	Total	
North American PhD Granting Depts.																						
Tenure-track	11	1	13	5	5	10	2	6	8	1	2	9	7	5	5	2	1	10	11	26	140	9.4%
Researcher	5	0	2	3	0	2	0	2	2	0	0	3	4	0	2	2	0	2	9	7	45	3.0%
Postdoc	25	1	2	9	1	7	5	17	5	2	0	6	2	5	7	5	0	5	16	28	148	10.0%
Teaching Faculty	4	0	1	4	2	1	0	2	1	2	0	3	0	3	3	1	0	5	4	6	42	2.8%
North American, Other Academic																						
Other CS/CE/I Dept.	6	0	4	9	0	3	4	4	4	2	0	8	0	2	2	0	1	4	6	3	62	4.2%
Non-CS/CE/I Dept.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
North American, Non-Academic																						
Industry	77	5	98	52	42	24	15	18	29	2	13	72	36	31	30	13	6	104	50	122	839	56.6%
Government	4	0	2	2	1	0	1	2	4	1	0	3	0	3	4	2	0	4	3	8	44	3.0%
Self-Employed	3	0	0	1	0	0	0	1	0	0	0	1	2	1	1	0	1	1	1	1	14	0.9%
Unemployed	0	0	1	0	0	2	0	0	0	0	0	0	0	2	0	1	1	0	2	3	12	0.8%
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total Inside North America	135	7	123	85	51	49	27	52	53	10	15	105	51	52	54	26	10	135	102	204	1346	90.8%

Table 9. Employment of New PhD Recipients By Specialty (Continued)

	Artificial Intelligence	Computer-Supported Cooperative Work	Databases / Information Retrieval	Graphics/Visualization	Hardware/Architecture	Human-Computer Interaction	High-Performance Computing	Informatics: Biomedical/ Other Science	Information Assurance/Security	Information Science	Information Systems	Networks	Operating Systems	Programming Languages/ Compilers	Robotics/Vision	Scientific/ Numerical Computing	Social Computing/ Social Informatics	Software Engineering	Theory and Algorithms	Other	Total	
Outside North America																						
Tenure-Track in PhD Granting	6	1	2	0	1	0	1	0	1	0	1	4	1	1	0	0	1	0	3	0	22	1.5%
Researcher in PhD	2	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1	6	0.4%
Postdoc in PhD	4	0	0	6	0	0	0	1	0	0	1	2	1	2	2	1	0	1	5	6	33	2.2%
Teaching in PhD	1	0	0	0	1	1	1	0	0	0	1	1	1	1	0	1	0	1	0	1	9	0.6%
Other Academic	2	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	2	11	0.7%
Industry	4	0	4	4	4	4	0	0	1	0	2	8	5	3	0	0	0	4	2	2	48	3.2%
Government	0	0	1	0	0	0	0	0	1	0	0	1	1	0	0	1	1	1	1	0	8	0.5%
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Total Outside NA	19	1	9	11	6	6	2	2	3	0	5	18	9	6	2	3	2	7	14	12	137	9.2%
Total with Employment Data, Inside North America plus Outside North America	154	8	132	96	57	55	29	54	56	10	20	123	60	58	56	29	12	142	116	216	1483	100%
Employment Type & Location Unknown	38	1	23	16	14	10	10	13	6	2	11	28	6	4	7	4	3	17	20	161	394	
Total	192	9	155	112	71	65	39	67	62	12	31	151	66	62	63	33	15	159	136	377	1877	

Unemployment of new Ph.D.s remains less than 1 percent. The proportion of Ph.D. graduates who were reported taking positions outside of North America, among those whose employment is known, decreased again this year to 9.2 percent, from 10 percent last year and 13.1 percent two years ago.

Table 9 also indicates the areas of specialty of new CS/CE Ph.D.s. Year-to-year fluctuations among these data are common and multi-year trends are difficult to discern. This year, there was an increase in the database/information systems area, which no doubt is influenced by the inclusion of I departments in this year's survey. On the other hand, the programming languages and OS/ networks area showed declines. AI/robotics took over from OS/networks as the area with the largest number of graduates. In this year's survey, we refined the choice of areas that the departments could use to classify Ph.D. recipients, including categories of interest to I departments. We will review the data in comparison with those of previous years to see if this classification is proving useful. There still are a large number of graduates classified as having their degree in some area not specified.

The proportion of women among new Ph.D.s rose for the third straight year, to 20.5 percent in 2008 from 19.1 percent the previous year. This includes I departments, which graduated women Ph.D.s. in higher proportion that did CS and CE departments. However, subtracting the I departments still results in an increase to 20.2 percent among CS and CE departments (Table 10).

Table 10. Gender of PhD Recipients by Type of Degree								
	CS		CE		I		Total	
Male	1,255	79.4%	153	83.2%	44	71.0%	1,452	79.5%
Female	325	20.6%	31	16.8%	18	29.0%	374	20.5%
Total known Gender	**1,580**		**184**		**62**		**1,826**	
Unknown	17		19		15		51	
Total	**1,597**		**203**		**77**		**1,877**	

Ethnicity characteristics of new Ph.D.s are similar to those reported last year (Table 11). This year, the ethnicity categories were modified to conform to those used by the National Center for Educational Statistics. Thus, the percentages may not all be entirely comparable. This year, we also broke out the reported data when residency status was known but ethnicity was not. Last year, we

combined data for ethnicity unknown and residency unknown. Coupled with the inclusion of I departments this year, extra care therefore must be taken when comparing percentages in this year's ethnicity tables with those from last year. Nevertheless, among CS and CE departments, it appears there was an increase in the proportion of new Ph.D.s to Whites this year, offset by a

Table 11. Ethnicity of PhD Recipients by Type of Degree									
	CS		CE		I		Total	
Nonresident Alien	807	55.5%	133	66.5%	38	50.0%	978	56.5%
American Indian or Alaska Native	5	0.3%	1	0.5%	0	0.0%	6	0.3%
Asian	178	12.2%	20	10.0%	5	6.6%	203	11.7%
Black or African-American	22	1.5%	2	1.0%	3	3.9%	27	1.6%
Native Hawaiian or Pacific Islander	0	0.0%	0	0.0%	1	1.3%	1	0.1%
White	419	28.8%	42	21.0%	29	38.2%	490	28.3%
Multiracial, not Hispanic	2	0.1%	0	0.0%	0	0.0%	2	0.1%
Resident Hispanic, any race	21	1.4%	2	1.0%	0	0.0%	23	1.3%
Total with Ethnicity Data	**1,454**		**200**		**76**		**1,730**	100.0%
Resident, race/ethnicity unknown	26		1		0		27	
Residency unknown	117		2		1		120	
Total	**1,597**		**203**		**77**		**1,877**	

decrease in those to Asians (including Native Hawaiian and Pacific Islanders).

Current Ph.D. enrollment proportions show a slight decline in women among CS and CE departments (from 19.5 percent to 18.9 percent), although when I departments are included the proportion this year is 20.0 percent (Table 12). With respect to ethnicity breakdowns, there appears to be a larger proportion of Nonresident Aliens this year, offset by a decrease in the proportion of Whites and Asians, including Native Hawaiian and Pacific Islander (Table 13).

Table 12. PhD Program Total Enrollment by Gender								
	CS		CE		I		Total	
Male	9,896	80.7%	1,182	84.2%	431	60.1%	11,509	80.0%
Female	2,364	19.3%	222	15.8%	286	39.9%	2,872	20.0%
Total have Gender Data for	12,260		1,404		717		14,381	
Unknown	185		0		0		185	
Total	12,445		1,404		717		14,566	

Table 13. PhD Program Total Enrollment by Ethnicity								
	CS		CE		I		Total	
Nonresident Alien	5,958	54.7%	916	71.8%	308	45.1%	7,182	55.9%
American Indian or Alaska Native	12	0.1%	22	1.7%	8	1.2%	42	0.3%
Asian	859	7.9%	58	4.5%	60	8.8%	977	7.6%
Black or African-American	194	1.8%	17	1.3%	27	4.0%	238	1.9%
Native Hawaiian or Pacific Islander	38	0.3%	1	0.1%	1	0.1%	40	0.3%
White	3,610	33.2%	236	18.5%	265	38.8%	4,111	32.0%
Multiracial, not Hispanic	43	0.4%	8	0.6%	2	0.3%	53	0.4%
Resident Hispanic, any race	173	1.6%	18	1.4%	12	1.8%	203	1.6%
Total have Ethnicity Data for	10,887		1,276		683		12,846	
Resident, race/ethnicity unknown	679		22		22		723	
Residency unknown	879		106		12		997	
Total	12,445		1,404		717		14,566	

Concluding Observations

It is encouraging to see a three-year increase in new undergraduate CS students and the increased total undergraduate enrollment. There also was a rise this year in the number of academic faculty positions available at the CRA departments, which is helpful given the continued peak production of new CS Ph.D.s (see the full Taulbee report for details). However, economic conditions have changed considerably since last year. How this will affect new Ph.D. hiring in both industry and academia remains to be seen. With the exception of diversity, our discipline entered these changed economic conditions from a position of strength. This should help us cope with the times much better than most.

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 (NRC).[3] New NRC rankings are anticipated later in 2009, and future Taulbee reports may be modified as a result.

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.[4] 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, Binghamton University SUNY, Boston University, Case Western Reserve, City University of New York Graduate Center, College of William and Mary, Colorado School of Mines, Colorado State, Dartmouth, DePaul, Drexel, Florida Institute of Technology, Florida International, Florida State, George Mason, Georgia State, Illinois Institute of

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

[4] 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.

Technology, Iowa State, Johns Hopkins, Kansas State, Kent State, Lehigh, Louisiana State, Michigan State, Michigan Technological, Mississippi State, Montana State, Naval Postgraduate School, New Jersey Institute of Technology, New Mexico State, New Mexico Technology, North Carolina State, North Dakota State, Northeastern, Northwestern, Oakland, Ohio State, Oklahoma State, Old Dominion, Oregon State, Pace, Pennsylvania State, Polytechnic, Portland State, Rensselaer Polytechnic, Rochester Institute of Technology, Stevens Institute of Technology, Syracuse, Texas A&M, Texas Tech, Toyota Technological Institute (Chicago), Tufts, Vanderbilt, Virginia Tech, Washington State, Washington (St. Louis), Wayne State, Worcester Polytechnic, and Wright State.

University of: Alabama (Birmingham, Huntsville, and Tuscaloosa), Albany SUNY, Arkansas (Fayetteville and Little Rock), Buffalo, California (at Davis, Riverside, Santa Barbara, and Santa Cruz), Central Florida, Cincinnati, Colorado (Boulder), Connecticut, Delaware, Florida, Georgia, Houston, Idaho, Illinois (Chicago), Iowa, Kansas, Kentucky, Louisiana (Lafayette), Louisville, Maine, Maryland (Baltimore Co.), Massachusetts (at Boston and Lowell), Minnesota, Mississippi, Missouri (at Columbia and Kansas City), 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 Dallas, El Paso, and San Antonio), Tulsa, Utah, and Wyoming.

Computer Engineering departments participating in the survey this year include: Boston University, Clemson, Florida Institute of Technology, Iowa State, Northeastern, Princeton, Purdue, Rensselaer Polytechnic, Santa Clara, Virginia Tech, and the Universities of California (Santa Cruz), Houston, New Mexico, Southern Californa.

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

Information departments participating in the survey include: Drexel University, Syracuse, and Universities of California (Berkeley), Illinois, Maryland (Baltimore County), Michigan, Pittsburgh, and Washington. I-programs at Indiana University and University of California (Irvine) also submitted information combined with their CS programs.

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