2000-2001 Taulbee Survey

Hope for More Balance in Supply and Demand

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This article and the accompanying tables present the results of the 31st annual CRA Taulbee Survey[1] of Ph.D.-granting departments of computer science (CS) and computer engineering (CE) in the United States and Canada. This survey is conducted annually by the Computing Research Association to document trends in student enrollment, employment of graduates, and faculty salaries.

Information is gathered during the fall and early winter. The period the data cover varies from table to table. ~~Degree production (Ph.D., Master's, and Bachelor's) and total Ph.D. enrollments refer to the previous academic year (2000-2001). Data for new students in all categories and total enrollments for Master's and Bachelor's degrees refer to the current academic year (2001-2002).~~ Projected student production and information on faculty salaries and demographics also refer to the current academic year. Faculty salaries are those effective January 1, 2002. Responses received by January 14, 2002 are included in the tables.

The data were collected from Ph.D.-granting departments only. A total of 215 departments were surveyed, compared with 214 departments last year. As shown in Figure 1, 173 departments returned their survey forms, for a response rate of 80 percent (compared with 81 percent last year). The return rate of 8 out of 28 (29%) for Computer Engineering (CE) programs is very low, although an improvement over recent years. We attribute this low response to two factors: 1) many CE programs are part of an ECE department, and they do not keep separate statistics for CE vs. EE; and 2) many of these departments are not aware of the Taulbee Survey or its importance. The response rate for US CS programs (142 of 164, or 87%) was very good, and the 100 percent response rate for Canadian programs is especially gratifying. We thank all respondents who completed this year's questionnaire. Departments that participated are listed at the end of this article.

Due to the low return rate for CE, we caution against drawing strong conclusions from the data presented for CE. In our discussion, we will focus on the combined numbers for CS and CE. Because of changes in the departments that respond from one year to the next, we must approach any trend analysis with caution.

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%)

For more details on how the faculty salary information is to be interpreted, see the article in the January 2002, *CRN* on Preliminary Taulbee Faculty Salary Data (http://www.cra.org/CRN/issues/0201.pdf). [**Note:** In the printed version of the January article, in Table 1, the column reporting the number of faculty in each category was incorrect (the five entries should have been 563, 761, 832, 1197, and 3353). These have been corrected in the online version of the January *CRN*. Table 27 in the current edition presents the corrected counts, incorporating numbers from 13 additional departments.]

The survey form itself is modified slightly each year to ensure as high a rate of return as possible (by simplifying and clarifying), while continuing to capture the data necessary to understand trends in the discipline and also reflect changing concerns of the computing research community. This year we added three new questions to obtain data previously collected on a separate departmental profiles survey. We decided to move these questions into the Taulbee because: 1) the data should be updated annually (the profiles survey is only conducted every 3 years), and 2) the response rate on the profiles survey has historically been low. The three new questions address external research support and graduate student funding (Tables 24-26).

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

As shown in Table 1, a total of 912 Ph.D. degrees were awarded in 2001 by the 173 responding departments. As Figure 2 indicates, this is a slight (4%) improvement over last year's 881, which was the lowest number in more than 10 years. Note, however, that some of this apparent increase could be due to shifts in the departments that responded to the survey.

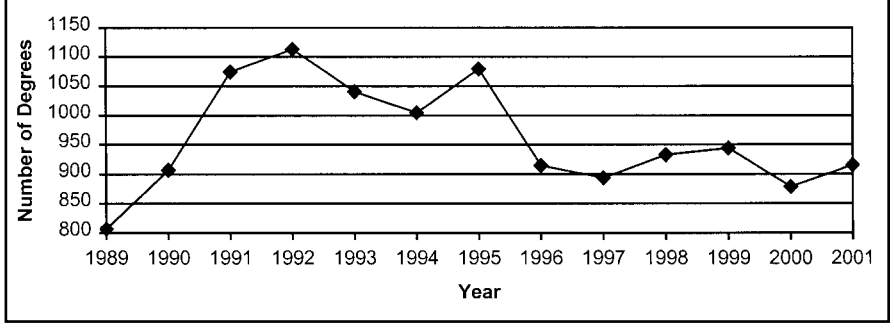
The prediction from last year's survey that 1,144 Ph.D. degrees would be awarded in 2001 was, as usual, overly optimistic, with an "optimism" ratio, defined as the actual over the predicted, being 0.80. Given next year's prediction of 1,205 graduates, we predict the actual number will be between 906 and 1,015.

All other numbers indicate a strong growth in the Ph.D. supply in the next few years. The number who entered Ph.D. programs (Table 5) increased from 2,062 to 2,702 (31%). The number who passed qualifiers (Table 1) increased from 1,119 to 1,244 (11%), and the number who passed their thesis proposal exams (Table 1) increased from 788 to 917 (16%). The total Ph.D. enrollments (Table 6) increased from 7,857 to 8,810 (12%). Looking beyond our survey results, some CS programs are reporting record numbers of applicants for their Ph.D. programs this year. It seems that the failure of the dot-com boom has convinced many recent Bachelor's and Master's degree recipients to return to graduate school.

Table 4 shows area of specialization versus types of first appointments for Ph.D. recipients in 2001. These statistics are also very similar to those from last year. There seems to be a slight shift from core areas of computer science (programming languages and theory) toward more applied areas (scientific computing, graphics, human interface, databases, and information systems), but the large number (202/933) whose specialization is uncategorized makes it risky to draw any strong conclusions.

Most statistics on gender and ethnicity for Ph.D. students (Tables 2, 3, 7, 8) show remarkably little change from last year. White and nonresident alien men continue to account for a very large fraction of our Ph.D. production and enrollments. Women constitute a significant minority (19% of enrollments, 16% of graduates.) All other underrepresented groups are very small minorities. As Figure 3 illustrates, we see a continuing increase in the proportion of enrolled Ph.D. students who are nonresident aliens.

Figure 2. Ph.D. Production



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

Almost all statistics on Master's and Bachelor's programs show major growth. Master's degrees were awarded to 8,266 students, an increase of 26 percent. Bachelor's degrees numbered 17,048, an increase of 15 percent. This year's Master's production exceeded the projection from last year's survey by 31 percent, while Bachelor's production exceeded projections by 7 percent. If this trend continues, then next year's projected production of 18,695 Bachelor's degrees (Table 11 and Figure 4) and 7,341 Master's degrees (Table 12) may be too low.

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

Department, Rank	Ph.D.s Produced	Ave. per Dept.	Ph.D.s Next Year	Ave. per Dept.	Passed Qualifier	Ave. per Dept.	Passed Thesis Exam	Ave. per Dept.
US CS 1-12	184	15.3	241	20.1	228	19.0	194	16.2
US CS 13-24	135	11.3	148	12.3	130	10.8	115	9.6
US CS 25-36	78	6.5	127	10.6	157	13.1	77	6.4
US CS Other	372	3.5	473	4.4	473	4.4	328	3.1
Canadian	102	4.4	100	4.3	57	2.5	81	3.5
US CE	41	5.1	116	14.5	199	24.9	122	15.3
Total	**912**	**5.2**	**1,205**	**6.9**	**1,244**	**7.1**	**917**	**5.3**

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The number of new undergraduates actually dropped slightly from 23,416 to 23,090 (1%) (see Figure 5), in contrast with significant increases in recent years. As yet, we cannot determine whether this was simply an artifact of the changes in the departments reporting, or the start of a new trend. Perhaps the decline in the technology industry is making computer science and engineering less alluring to new undergraduates. In addition, some programs may be operating in "saturation" mode, where they simply cannot accept more undergraduate majors given their teaching resources.

In all other numbers, we see growth in both Bachelor's and Master's programs. New Master's students (Table 13) increased by 22 percent, total enrollments in Bachelor's programs increased by 8%, and enrollments in Master's programs increased by 10%.

Most demographics regarding gender and ethnicity for Bachelor's and Master's students show remarkable stability from last year. As with Ph.D. recipients, the proportion of Master's degree recipients who are nonresident aliens continually climbs, from 52 percent last year to 57 percent this year.

Faculty Demographics *(Tables 17-23)*

The total number of faculty increased by 8 percent over the past year to a total of 5,344. These increases came in all categories, with an especially large (60%) increase in postdocs. Considering that 140 faculty are reported to have left academia (Table 23), the survey indicates 759 new faculty this year. Our Ph.D. production shows only 326 graduates taking faculty positions (Table 4.) Some of the new teaching faculty may not have Ph.D. degrees, and some new faculty may have come from nonacademic sources. There is some influx of existing Ph.D. holders into academia as industrial labs are being downsized and reorganized.

This year's faculty growth to 5,344 was slightly less than the prediction of 5,465 from last year's survey. Still, this indicates that departments generally met their faculty recruiting targets. The planned two-year growth rate of 21 percent is the same as last year. Last year they predicted growing to 5,966 for 2002-2003, but this year they have adjusted the prediction for the same time period to 5,613. Last year we observed that the planned growth targets were unrealistically aggressive, compared with the predicted supply of new Ph.D.s. This year, the combination of increasing supply and decreasing targets make the recruiting objectives seem more feasible.

Table 23 on faculty "losses" showed that a large number took academic positions elsewhere. Only 140 (2.6% of total faculty) actually left academia through death, retirement, or taking a nonacademic position. This compares with 115 (2.3% of total faculty) last year. Overall, the rate of departures over the past few years has remained within the very stable range of between 2.3 percent and 2.6 percent.

The demographic data for faculty (Tables 19–22) are very similar to those from last year. We see that the gender split of new faculty (83% male, 17% female) is very close to the split for new Ph.D. recipients (Table 2). There is some skew in the distribution, with somewhat more men in tenure-track (85%) and research (87%) positions, and somewhat more women in teaching and other (both 22%) positions, but these numbers are actually somewhat more balanced than in previous years.

It is interesting to compare the ethnicity data for new faculty (Table 20) with that of Ph.D. recipients (Table 3). Fully 60 percent of the new faculty are white, non-Hispanic, even though only 38 percent of the Ph.D. recipients are in this category. By contrast, only 17 percent of the new faculty are nonresident aliens, whereas fully 46 percent of the degree recipients are in that category. Some new faculty could have become residents after receiving their Ph.D. degrees, but it seems clear that proportionately fewer foreign students take positions at U.S. universities.

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

	CS		CE		CS&CE	
Male	673	84%	69	82%	742	84%
Female	129	16%	15	18%	144	16%
Total have Gender Data for	**802**		**84**		**886**	
Unknown	26		0		26	
Total	**828**		**84**		**912**	

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

	CS		CE		CS&CE	
Nonresident Alien	328	44%	48	64%	376	46%
African American, Non-Hispanic	9	1%	0	0%	9	1%
Native American or Alaskan Native	1	0%	0	0%	1	0%
Asian or Pacific Islander	91	12%	11	15%	102	12%
Hispanic	7	1%	0	0%	7	1%
White, Non-Hispanic	292	39%	16	21%	308	38%
Other/Not Listed	17	2%	0	0%	17	2%
Total have Ethnicity Data For	**745**		**75**		**820**	
Ethnicity/Residency Unknown	83		9		92	
Total	**828**		**84**		**912**	

Figure 3. Nonresident Aliens as Fraction of Ph.D. Enrollments

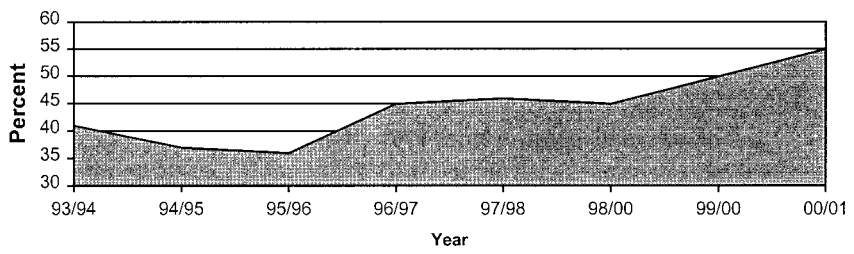

Table 4. Employment of New Ph.D. Recipients by Specialty

New Ph.D.s in Ph.D. Granting Depts.	Artificial Intelligence/ Robotics	Hardware/Architecture	Numerical Analysis/ Scientific Computing	Programming Languages/Compilers	OS/Networks	Software Engineering	Theory/Algorithms	Graphics/ Human Interfaces	Databases/ Information Systems	Other/Unknown	Total		
Tenure-Track	22	14	2	11	27	16	18	20	17	10	**157**	21%	39%
Researcher	11	2	11	2	9	2	4	9	0	4	**54**	7%	
Postdoc	12	2	4	2	8	4	13	6	2	3	**56**	7%	
Teaching Faculty	6	2	0	0	3	2	4	2	1	7	**27**	4%	
New Ph.D.s, Other Categories													
Other CS/CE Dept.	11	1	2	1	1	1	3	1	9	1	**31**	4%	61%
Non-CS/CE Dept.	1	0	0	0	0	0	0	0	0	0	**1**	0%	
Industry	45	46	11	24	86	29	20	32	44	29	**366**	49%	
Government	5	1	1	0	1	3	0	0	1	1	**13**	2%	
Self-Employed	2	0	2	0	2	0	0	2	2	1	**11**	1%	
Employed Abroad	5	2	2	2	5	3	2	5	3	2	**31**	4%	
Unemployed	0	0	0	0	0	0	1	1	0	4	**6**	1%	
Total have Employment Data for	**120**	**70**	**35**	**42**	**142**	**60**	**65**	**78**	**79**	**62**	**753**	**100%**	**100%**
Unknown	9	2	3	3	6	2	8	5	2	140	**180**		
Total	**129**	**72**	**38**	**45**	**148**	**62**	**73**	**83**	**81**	**202**	**933**		

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Table 5. New Ph.D. Students in Fall 2001 by Department Type and Rank

	CS				CE				CS & CE	
Department, Rank	New Admit	MS to Ph.D.	Total	Ave. per Dept.	New Admit	MS to Ph.D.	Total	Ave. per Dept.	Total	Ave. per Dept.
US CS 1-12	414	49	463	38.6	0	0	0	0.0	463	38.6
US CS 13-24	347	30	377	31.4	2	1	3	0.3	380	31.7
US CS 25-36	295	23	318	26.5	0	0	0	0.0	318	26.5
US CS Other	885	167	1052	9.8	47	8	55	0.5	1107	10.3
Canadian	110	36	146	6.3	14	5	19	0.8	165	7.2
US CE	0	0	0	0.0	154	115	269	33.6	269	33.6
Total	**2,051**	**305**	**2,356**	**13.5**	**217**	**129**	**346**	**2.0**	**2,702**	**15.5**

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

As mentioned earlier, we added three new questions to the Taulbee Survey this year, incorporating key data that previously have been collected as part of a separate departmental profiles survey.

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

The second question asked departments to "provide the number of graduate students supported as full-time students as of fall 2001," further categorized as teaching assistants, research assistants, fellows, or computer systems' supporters, and split between those on institutional vs. external funds. The results are shown in Table 25. Overall, we can see that the higher ranked schools are able to support more students with research positions through research assistantships and fellowships, while the other schools rely more on teaching assistantships to support their students. Canadian schools also have a high proportion (49%) of students supported via teaching assistantships. The number supported for computer systems support is very small.

The third question asked respondents to "provide the net amount (as of fall 2001) of an academic-year stipend for a graduate student (not including tuition or fees)." The results are shown in Table 26. Canadian stipends are shown in Canadian dollars. The numbers suggest a gap between departments in the top two ranking bands and departments in lower bands in all categories of graduate-student support.

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

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1601	21%	0	0%	1601	18%
US CS 13-24	1300	17%	12	1%	1312	15%
US CS 25-36	997	13%	0	0%	997	11%
US CS Other	3258	42%	260	25%	3518	40%
Canadian	623	8%	95	9%	718	8%
US CE	0	0%	664	64%	664	8%
Total	**7,779**		**1,031**		**8,810**	

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

	CS		CE		CS & CE	
Male	6,072	80%	871	84%	6,943	81%
Female	1,514	20%	160	16%	1,674	19%
Total have Gender Data for	**7,586**		**1,031**		**8,617**	
Unknown	193		0		183	
Total	**7,779**		**1,031**		**8,810**	

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

	CS		CE		CS&CE	
Nonresident Alien	3,715	53%	642	70%	4,357	55%
African American, Non-Hispanic	117	2%	22	2%	139	2%
Native American or Alaskan Native	6	0%	1	0%	7	0%
Asian or Pacific Islander	734	10%	50	5%	784	10%
Hispanic	82	1%	8	1%	90	1%
White, Non-Hispanic	2,303	33%	185	20%	2,488	31%
Other/Not Listed	69	1%	4	0%	73	1%
Total have Ethnicity Data For	**7,026**		**912**		**7,938**	
Ethnicity/Residency Unknown	753		119		872	
Total	**7,779**		**1,031**		**8,810**	

Faculty Salaries *(Tables 27-34)*

The U.S. average salaries have increased by 5 percent to 7 percent for different categories of U.S. faculty, similar to last year. Canadian salaries (shown as 12-month salaries in Canadian dollars) for tenure-track faculty also increased by 5 to 7 percent for the different categories. Salaries for non-tenure-track teaching faculty show a much greater increase (20%). These numbers are skewed by the presence of one highly paid lecturer at a school with only one such employee; nevertheless, there is evidence of significant salary increases at other institutions.

Concluding Observations

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

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Figure 4. B.S. Production

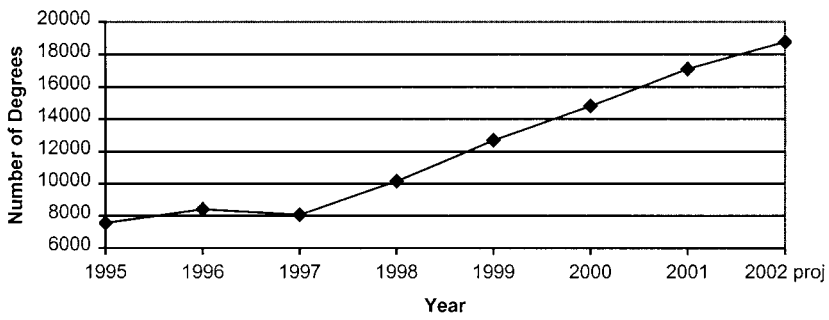

Figure 5. Newly Declared CS/CE Undergraduates Majors

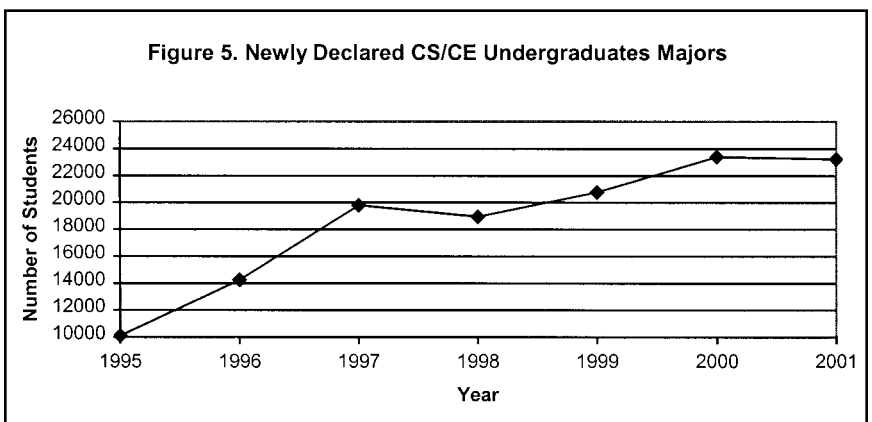

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Table 9. Gender of Bachelor's and Master's Recipients

	Bachelor's						Master's					
	CS		CE		CS & CE		CS		CE		CS & CE	
Male	10,903	80%	2,178	86%	13,081	81%	5,174	73%	708	75%	5,882	73%
Female	2,679	20%	343	14%	3,022	19%	1,923	27%	237	25%	2,160	27%
Total have Gender Data for	**13,582**		**2,521**		**16,103**		**7,097**		**945**		**8,042**	
Unknown	845		100		945		222		2		224	
Total	**14,427**		**2,621**		**17,048**		**7,319**		**947**		**8,266**	

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

	Bachelor's						Master's					
	CS		CE		Total		CS		CE		Total	
Nonresident Alien	903	9%	157	8%	1,060	9%	3,677	57%	489	56%	4,166	57%
African American, Non-Hispanic	311	3%	93	5%	404	3%	89	1%	22	3%	111	2%
Native American or Alaskan Native	37	0%	6	0%	43	0%	2	0%	4	0%	6	0%
Asian or Pacific Islander	2,349	23%	369	18%	2,718	23%	1,036	16%	174	20%	1,210	16%
Hispanic	362	4%	80	4%	442	4%	83	1%	11	1%	94	1%
White, Non-Hispanic	5,521	55%	1115	54%	6,636	55%	1,475	23%	175	20%	1,650	22%
Other/Not Listed	517	5%	231	11%	748	6%	118	2%	1	0%	119	2%
Total have Ethnicity Data For	**10,000**		**2,051**		**12,051**		**6,480**		**876**		**7,356**	
Ethnicity/Residency Unknown	4,427		570		4,997		839		71		910	
Total	**14,427**		**2,621**		**17,048**		**7,319**		**947**		**8,266**	

Table 11. Bachelor's Degree Candidates for 2001-2002 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1958	13%	266	8%	2224	12%
US CS 13-24	1512	10%	477	15%	1989	11%
US CS 25-36	1479	10%	69	2%	1548	8%
US CS Other	7353	47%	1477	47%	8830	47%
Canadian	3234	21%	355	11%	3589	19%
US CE	0	0%	515	16%	515	3%
Total	**15,536**		**3,159**		**18,695**	

Table 12. Master's Degree Candidates for 2001-2002 by Department Type and Rank

Department, Rank	CS		CE		CS & CE	
US CS 1-12	850	13%	0	0%	850	12%
US CS 13-24	689	10%	3	0%	692	9%
US CS 25-36	454	7%	0	0%	454	6%
US CS Other	4096	62%	343	45%	4439	60%
Canadian	491	7%	86	11%	577	8%
US CE	0	0%	329	43%	329	4%
Total	**6,580**		**761**		**7,341**	

Table 13. New Master's Students in Fall 2001 by Department Type and Rank

	CS		CE		CS & CE	
Department, Rank	Total	Ave. per Dept.	Total	Ave. per Dept.	Total	Ave. per Dept.
US CS 1-12	644	53.7	0	0.0	644	53.7
US CS 13-24	621	51.8	2	0.2	623	51.9
US CS 25-36	480	40.0	0	0.0	480	40.0
US CS Other	4310	41.4	687	6.6	4997	48.0
Canadian	692	31.5	65	3.0	757	34.4
US CE	0	0.0	290	32.2	290	32.2
Total	**6,747**	**39.5**	**1,044**	**6.1**	**7,791**	**45.6**

Table 14. New Undergraduate Students in Fall 2001 by Department Type and Rank

	CS			CE			CS & CE Majors	
Department, Rank	Pre-Major	Major	Average Major per Dept.	Pre-Major	Major	Average Major per Dept.	Total	Average Major per Dept.
US CS 1-12	380	1102	100.2	0	340	30.9	1442	131.1
US CS 13-24	40	1401	116.8	0	394	32.8	1795	149.6
US CS 25-36	519	1737	144.8	0	0	0.0	1737	144.8
US CS Other	4756	10319	99.2	1053	2033	19.5	12352	118.8
Canadian	1251	4397	199.9	0	681	31.0	5078	230.8
US CE	0	0	0.0	862	686	76.2	686	76.2
Total	**6,946**	**18,956**	**111.5**	**1,915**	**4134**	**24.3**	**23,090**	**135.8**

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economy), whether it simply indicates that many programs are operating at full capacity and cannot expand further, or whether it is just an artifact of the shifting departments responding to our survey.

Rankings

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

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

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

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

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

University of: Alabama (Birmingham, Huntsville, and Tuscaloosa), Arkansas, California (Davis, Santa Barbara, and Santa Cruz), Cincinnati, Colorado (Boulder and Colorado Springs), Connecticut, Delaware, Denver, Florida, Georgia, Hawaii, Houston, Idaho, Illinois (Chicago), Iowa, Kansas, Kentucky, Louisiana (Lafayette), Maine, Maryland

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

Department, Rank	CS		CE		CS & CE	
US CS 1-12	1419	9%	0	0%	1,419	8%
US CS 13-24	1347	8%	8	0%	1,355	7%
US CS 25-36	628	4%	0	0%	628	3%
US CS Other	12510	76%	982	48%	13,492	73%
Canadian	511	3%	374	18%	885	5%
US CE	0	0%	677	33%	677	4%
Total	**16,415**		**2,041**		**18,456**	

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

	CS			CE			CS & CE Majors	
Department, Rank	Pre-Major	Major	Average Major per Dept.	Pre-Major	Major	Average Major per Dept.	Total	Average Major per Dept.
US CS 1-12	584	6025	547.7	0	704	64.0	6,729	611.7
US CS 13-24	540	4997	416.4	53	1689	140.8	6,686	557.2
US CS 25-36	1242	6174	514.5	0	0	0.0	6,174	514.5
US CS Other	8007	38144	366.8	1401	6809	65.5	44,953	432.2
Canadian	3020	15763	716.5	0	2550	115.9	18,313	832.4
US CE	0	0	0.0	580	2446	271.8	2,446	271.8
Total	**13,393**	**71,103**	**418.3**	**2,034**	**14,198**	**83.5**	**85,301**	**501.8**

Table 17. Actual and Anticipated Faculty Size by Position

	Actual	Projected			
	2001-2002	2002-2003	2003-2004	Expected Two-Year Growth	
Tenure-Track	3,854	4,279	4,647	793	21%
Researcher	396	448	496	100	25%
Postdoc	332	410	469	137	41%
Teaching Faculty	665	722	770	105	16%
Other/Not Listed	97	96	100	3	3%
Total	**5,344**	**5,955**	**6,482**	**1,138**	**21%**

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

	Actual	Projected			
	2001-2002	2002-2003	2003-2004	Expected Two-Year Growth	
US CS 1-12	655	703	766	111	17%
US CS 13-24	499	569	619	120	24%
US CS 25-36	446	477	531	85	19%
US CS Other	2,594	2,929	3,198	604	23%
Canadian	946	1,051	1,124	178	19%
US CE	204	226	244	40	20%
Total	**5,344**	**5,955**	**6,482**	**1,138**	**21%**

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Table 19. Gender of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching Faculty		Other		Total	
Male	336	85%	60	87%	91	84%	139	78%	7	78%	633	83%
Female	58	15%	9	13%	17	16%	40	22%	2	22%	126	17%
Total	**394**	**52%**	**69**	**9%**	**108**	**14%**	**179**	**24%**	**9**	**1%**	**759**	
Unknown	0		0		0		0		0		759	

Table 20. Ethnicity of Newly Hired Faculty

	Tenure-Track		Researcher		Postdoc		Teaching Faculty		Other		Total
Nonresident Alien	50	15%	6	9%	38	36%	18	12%	2	22%	114
African American, Non-Hispanic	2	1%	0	0%	1	1%	5	3%	0	0%	8
Native American or Alaskan Native	3	1%	0	0%	0	0%	1	1%	0	0%	4
Asian or Pacific Islander	70	21%	19	29%	10	9%	18	12%	3	33%	120
Hispanic	4	1%	1	2%	0	0%	4	3%	0	0%	9
White, Non-Hispanic	193	58%	40	61%	57	53%	107	69%	4	44%	401
Other/Not Listed	12	4%	0	0%	1	1%	1	1%	0	0%	14
Total have Ethnicity Data For	**334**		**66**		**107**		**154**		**9**		**670**
Ethnicity/Residency Unknown	60		3		1		25		0		89
Total	**394**		**69**		**108**		**179**		**9**		**759**

Table 21. Gender of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Total	
Male	1,554	92%	1025	86%	920	86%	572	74%	4,071	86%
Female	130	8%	163	14%	150	14%	206	26%	649	14%
Total have Gender Data for	**1,684**	36%	**1,188**	25%	**1,070**	23%	**778**	16%	**4,720**	

Table 22. Ethnicity of Current Faculty

	Full		Associate		Assistant		Teaching Faculty		Total	
Nonresident Alien	12	1%	23	2%	152	16%	32	4%	219	5%
African American, Non-Hispanic	15	1%	12	1%	18	2%	23	3%	68	2%
Native American or Alaskan Native	14	1%	6	1%	5	1%	1	0%	26	1%
Asian or Pacific Islander	249	16%	221	21%	170	18%	49	7%	689	16%
Hispanic	24	2%	19	2%	23	2%	16	2%	82	2%
White, Non-Hispanic	1,168	76%	756	71%	552	58%	590	81%	3,066	72%
Other/Not Listed	45	3%	29	3%	25	3%	14	2%	113	3%
Total have Ethnicity Data For	**1,527**		**1,066**		**945**		**725**		**4,263**	
Ethnicity/Residency Unknown	157		122		125		53		457	
Total	**1,684**		**1,188**		**1,070**		**778**		**4,720**	

Table 23. Faculty Losses

	Total
Died	14
Retired	62
Took Academic Position Elsewhere	138
Took Nonacademic Position	64
Remained, Changed to Part Time	22
Other	24
Unknown	11
Total	**335**

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(Baltimore Co.), Massachusetts (Lowell), Minnesota, Missouri (Rolla and Columbia), Nebraska (Lincoln), Nevada (Las Vegas), New Hampshire, New Mexico, North Texas, Notre Dame, Oklahoma, Oregon, Pittsburgh, South Carolina, South Florida, Tennessee (Knoxville), Texas (Arlington and Dallas), Utah, Wisconsin (Milwaukee), and Wyoming.

Computer Engineering departments participating in the survey this year include: Georgia Institute of Technology, Northwestern, Oregon State, Purdue, Rensselaer Polytechnic, Santa Clara, University of California (Santa Cruz), and the University of New Mexico.

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, Quebec (Montreal), Regina, Saskatchewan, Toronto (CS and ECE), Victoria, Waterloo, and Western Ontario.

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Jean Smith, Patrick McMullen, and Bill Aspray assisted with the data collection, tabulation, and analysis for this survey. We thank them for their assistance. Stu Zweben participated in the discussion of the analysis, and provided useful suggestions for this document.

Endnotes

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

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

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

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

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

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

Department, Rank	Total Expenditure Minimum	Total Expenditure Average	Total Expenditure Maximum	Per Capita Expenditure Minimum	Per Capita Expenditure Average	Per Capita Expenditure Maximum
US CS 1-12	$1,700,000	$16,164,476	$48,172,085	$109,677	$465,567	$866,274
US CS 13-24	$3,426,625	$8,221,119	$13,000,000	$135,897	$297,867	$608,532
US CS 25-36	$692,886	$4,103,609	$11,488,546	$49,281	$155,676	$250,000
US CS Other	$100,000	$1,766,006	$11,360,895	$7,692	$99,103	$571,105
Canadian	$115,743	$2,954,000	$13,500,000	$5,787	$88,048	$265,452
US CE	$13,156	$1,183,717	$3,165,098	$1,196	$57,742	$166,666

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

Department/ Rank	No. on Institutional Funds: Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other		No. on External Funds: Teaching Assistants		Research Assistants		Full-Support Fellows		Graduate Assistants for Computer Systems Support		Other	
US CS 1-12	632	27%	33	1%	80	3%	1	0%	4	0%	0	0%	1,375	58%	249	10%	1	0%	3	0%
US CS 13-24	346	22%	151	9%	149	9%	7	0%	57	8%	0	0%	866	54%	26	2%	0	0%	3	0%
US CS 25-36	566	41%	54	4%	33	2%	31	2%	7	1%	1	0%	620	45%	55	4%	0	0%	5	0%
US CS Other	2,861	49%	462	8%	125	2%	124	2%	73	2%	7	0%	2,109	36%	59	1%	9	0%	41	1%
Canadian	1,037	49%	294	14%	12	1%	4	0%	54	4%	24	1%	573	27%	56	3%	2	0%	40	2%
US CE	305	43%	38	5%	34	5%	1	0%	2	1%	5	1%	289	41%	29	4%	0		2	0%
Total	**5,747**	41%	**1,032**	7%	**433**	3%	**168**	1%	**197**	3%	**37**	0%	**5,832**	42%	**474**	3%	**12**	0%	**94**	1%

Table 26. Fall 2001 Academic-Year Graduate Stipends by Department Type and Rank

Department, Rank	Teaching Assistants Minimum	Teaching Assistants Mean	Teaching Assistants Maximum	Research Assistants Minimum	Research Assistants Mean	Research Assistants Maximum	Full-Support Fellows Minimum	Full-Support Fellows Mean	Full-Support Fellows Maximum	Grad. Assistants for Computer Systems Support Minimum	Grad. Assistants for Computer Systems Support Mean	Grad. Assistants for Computer Systems Support Maximum	Other Minimum	Other Mean	Other Maximum
US CS 1-12	$9,250	$15,001	$18,000	$13,378	$16,069	$18,000	$15,750	$16,993	$20,000	$14,250	$15,122	$15,993	$15,993	$19,934	$27,000
US CS 13-24	$3,362	$15,278	$20,000	$13,464	$16,685	$22,440	$13,252	$16,208	$22,440	$14,420	$15,999	$17,700	$1,300	$1,300	$1,300
US CS 25-36	$10,880	$13,172	$15,867	$10,751	$13,781	$15,381	$12,000	$14,713	$18,000	$4,250	$10,583	$14,000	$11,900	$12,690	$13,500
US CS Other	$3,483	$11,542	$23,067	$4,073	$12,880	$26,692	$1,350	$15,484	$31,950	$4,770	$11,759	$24,000	$1,360	$11,587	$28,000
Canadian	$3,000	$10,369	$21,510	$4,500	$11,587	$21,572	$13,000	$22,307	$33,373	$12,000	$17,927	$33,500	$1,875	$11,344	$16,500
US CE	$9,900	$12,360	$14,145	$6,976	$13,155	$19,140	$11,700	$15,709	$22,000	$9,600	$9,750	$9,900	$0	$0	$0

Table 27. Nine-month Salaries, 141 Responses of 164 US CS Computer Science Departments

Faculty Rank	Number of Faculty	Reported Salary Minimum: Minimum	Reported Salary Minimum: Mean	Reported Salary Minimum: Maximum	Average of all Salaries	Reported Salary Maximum: Minimum	Reported Salary Maximum: Mean	Reported Salary Maximum: Maximum
Non-Tenure Teaching Faculty	606	$24,000	$47,944	$96,084	$55,450	$34,901	$65,062	$130,000
Assistant	805	$45,996	$68,740	$86,829	$72,691	$50,004	$76,443	$116,390
Associate	890	$45,624	$73,520	$117,000	$81,050	$67,064	$90,115	$147,750
Full	1,245	$49,500	$85,630	$139,000	$105,396	$79,697	$136,904	$264,892

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

Faculty Rank	Number of Faculty	Reported Salary Minimum: Minimum	Reported Salary Minimum: Mean	Reported Salary Minimum: Maximum	Average of all Salaries	Reported Salary Maximum: Minimum	Reported Salary Maximum: Mean	Reported Salary Maximum: Maximum
Non-Tenure Teaching Faculty	69	$31,500	$56,384	$96,084	$68,852	$64,800	$84,111	$100,404
Assistant	105	$49,500	$72,419	$78,500	$78,250	$78,304	$83,045	$88,000
Associate	91	$60,825	$81,462	$102,800	$88,232	$77,700	$96,265	$120,000
Full	216	$49,500	$88,106	$106,400	$119,665	$138,000	$166,364	$188,800

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

Faculty Rank	Number of Faculty	Reported Salary Minimum: Minimum	Reported Salary Minimum: Mean	Reported Salary Minimum: Maximum	Average of all Salaries	Reported Salary Maximum: Minimum	Reported Salary Maximum: Mean	Reported Salary Maximum: Maximum
Non-Tenure Teaching Faculty	54	$46,542	$59,936	$81,840	$69,019	$61,000	$80,233	$130,000
Assistant	76	$69,200	$75,956	$84,000	$80,324	$78,381	$84,748	$93,600
Associate	63	$74,700	$84,601	$95,000	$91,756	$83,000	$99,231	$141,500
Full	195	$74,590	$89,190	$108,100	$121,580	$147,500	$174,470	$264,892

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

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	47	$38,480	$52,520	$73,712	$59,901	$47,500	$71,705	$129,150
Assistant	84	$64,400	$71,690	$80,000	$75,051	$68,000	$78,555	$87,188
Associate	87	$62,963	$77,809	$86,536	$84,456	$83,600	$94,139	$112,500
Full	146	$68,199	$86,729	$99,350	$114,218	$109,200	$161,186	$245,575

Table 31. Nine-month Salaries, 106 Responses of 128 US Computer Science Departments Ranked Higher than 36 or Unranked

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	436	$24,000	$44,952	$80,000	$51,805	$34,901	$60,368	$114,480
Assistant	540	$45,996	$67,131	$86,829	$70,898	$50,004	$74,486	$116,390
Associate	649	$45,624	$70,975	$117,000	$78,719	$67,064	$88,006	$145,750
Full	688	$59,660	$84,807	$139,000	$100,871	$79,697	$126,347	$194,893

Table 32. Nine-month Salaries, 8 Responses of 28 US Computer Engineering Departments

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	8	$50,688	$58,096	$67,194	$65,400	$50,688	$72,703	$92,700
Assistant	54	$55,000	$68,705	$80,100	$72,285	$68,000	$75,441	$82,500
Associate	64	$60,200	$71,325	$79,006	$75,944	$60,200	$83,969	$98,000
Full	110	$79,400	$85,909	$95,000	$98,158	$80,220	$132,893	$180,000

Table 33. Twelve-month Salaries, 23 Responses of 23 Canadian Computer Science Departments (Canadian Dollars)

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	67	$44,097	$59,169	$108,000	$63,780	$46,809	$69,707	$108,000
Assistant	186	$54,019	$69,202	$95,000	$75,208	$57,368	$82,359	$117,000
Associate	206	$60,319	$76,452	$111,000	$87,107	$78,684	$98,368	$150,000
Full	296	$50,211	$85,827	$119,912	$104,845	$91,557	$130,158	$182,000

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

Faculty Rank	Number of Faculty	Reported Salary Minimum			Average of all Salaries	Reported Salary Maximum		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Non-Tenure Teaching Faculty	67	$44,097	$59,169	$108,000	$63,780	$46,809	$69,707	$108,000
Tenure-Track	101	$45,996	$73,393	$85,000	$73,979	$45,996	$74,646	$86,000
Researcher	8	$27,000	$53,830	$93,000	$54,187	$27,000	$54,544	$93,000
Non-Tenure Teaching Faculty	10	$35,000	$51,767	$63,000	$52,374	$35,000	$54,671	$72,785
Postdoc	22	$28,500	$46,475	$60,000	$47,776	$28,500	$49,665	$60,000

CRA Conference at Snowbird

It's time once again to begin thinking about Snowbird! Mark your calendars for CRA's biennial conference scheduled for July 14-16, 2002 in Snowbird, Utah. See back page to review the preliminary program.

This is CRA's flagship conference for chairs of Ph.D.-granting departments of computer science and computer engineering, as well as leaders from U.S. industrial and government computing research laboratories and centers. A number of other senior people from research groups, government, academia, and professional societies also attend.

The Snowbird Committee has been working since last fall to put together a strong program to address many of the biggest issues facing CS&E departments and research organizations.

The conference opens with a keynote address by Robert Kahn, President of the Corporation for National Research Initiatives (CNRI) and a driver of major computing research initiatives for the past 30 years. There are three joint industry/academic plenary sessions: Bioinformatics and Computational Biology; Diversifying Computing—Three Perspectives; and Homeland Security. Peter Freeman, newly appointed assistant director for the NSF Computer and Information Science and Engineering (CISE) Directorate, will give a keynote luncheon address. The program also will offer a workshop for new department chairs.

Every non-plenary time slot has workshop sessions of interest both to industrial research directors and academic attendees. Some focus on technical issues, such as the relationship of computer science and engineering to other research disciplines and efforts to set new research directions. Some cover problems of industry, such as the future of corporate labs and of industry/academic interaction, such as collaboration models and legal agreements. Other sessions of general interest address the business of publications, public policy aspects of computing research, and the evolution of IT into a profession.

For the academic audience, there are sessions on undergraduate curriculum and accreditation, developing a research environment in traditionally non-research departments, research funding, recruiting and retention, new academic structures, and new pressures on CS&E academic units.

The opportunity to network with peers is one of the most valuable aspects of the conference, and it comes around only once every two years. So make your plans to escape to the mountains in July and join the crowd for several days of stimulating discussions about the future of computer science and engineering research.

For details about the program, accommodations, and registration, please visit the CRA Web site at: http://www.cra.org/. ▮

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