



**Research
News On
Minority
Graduate
Education
(MGE)
Volume 2
Number 1
February 2000**

In this issue:

[Ph.D. Enrollment in
Computer Science Up
for the Third
Straight Year](#)

[An Interview with Dr.
Meera Chandrasekhar](#)

[Some
Valuable Lessons Can
Be Learned from the
Strategies of Winning
Football Coaches](#)

[A Profile of an MGE
Institution:
Rice University](#)

[From the editors](#)

**Managing
Editor:** Yolanda
S. George
Editor:
Virginia Van Horne
Art Director:
Ann Williams

From the Editors:

Each issue of Making Strides features a profile on an institution that received an NSF Minority Graduate Education (MGE) award. This issue we are pleased to include an article written by Jordan Konisky, Vice Provost for Research and Graduate Studies and the Principal Investigator for the MGE Program at Rice University.

Jay Dull, Interim Executive Director of the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) and Human Resource Manager for Ford Motor Company, shares some anecdotal information gleaned from various "rap" sessions with Ph.D. students on several campuses which applied for membership to the GEM Consortium. And, the Computing Research Engineering Association has graciously given us permission to reprint an article from the March, 1999 issue of Computing Research News on Ph.D. enrollment trends.

We also want to remind you to mark your calendars for the MGE meeting in Atlanta Georgia on February 24-26, 2000. We are partnering with NSF and the EMERGE Alliance, chaired by Georgia Tech, on a national dialogue to increase minority participation in the fields of science, engineering, and mathematics called Workshop 2000. Our aim is to identify and disseminate the successful strategies that lead to the increased participation and retention of African Americans, Hispanic Americans, and Native Americans in science, mathematics, and engineering doctoral programs, in particular, the professoriate. The workshop audience will include NSF minority graduate education grantees, as well as leaders from higher education, corporations, and foundations and government. The meeting format will feature keynotes, panels, and breakout groups, allowing all participants to interact and engage in dialogue. For further information, please visit <http://130.207.159.132/emerge/emerge/cfm> or send email to mge@aaas.org

October, and January)
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Program. Its purpose is to
share information about
minority graduate education
(MGE) in the fields of
science, mathematics, and
engineering. It is available
in print and electronic
format.
Inquiries, information related
to MGE, and all
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Ph.D. Enrollment in Computer Science Up for the Third Straight Year

By Dexter Kozen and Jim Morris

*Reprinted with permission from Computing Research News,
1997-98 CRA Taulbee Survey, March 1999, pp. 1-5.*

This article and the accompanying tables present the results of the 28th annual CRA Taulbee Survey¹ of Ph.D. granting departments of computer science (CS) and computer engineering (CE) in the United States and Canada. This survey is conducted annually by CRA to document trends in student enrollment, employment of graduates, and faculty salaries. Information is gathered during the fall and early winter. Responses received by January 20, 1999 are included in the tables.

The survey results are from Ph.D. granting departments only. One hundred and eighty-six departments were surveyed. Information on degree production (Ph.D., Master's, and Bachelor's) and enrollment (Ph.D.) applies to the previous academic year (1997-98). New students in all categories and total enrollments for Master's and Bachelor's refer to the current academic year (1998-99). Projected production refers to the current academic year as well. Information on faculty salaries and demographics also applies to the current academic year. Faculty salaries are those effective January 1, 1999.²

This article presents the most significant results of the survey, with particular attention to those that differ markedly from last year or that appear to indicate long-term trends.

This year 144 departments submitted surveys -- 144 responded to the Ph.D. section, 140 to the Master's section, and 138 to the Bachelor's section. All 144 departments provided faculty information. The response rate was 77%, down slightly from last year's rate of 80%; however, the overall number of departments responding this year was

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higher (144 versus 135). We thank all respondents who completed the questionnaire.

Two new questions were added to the survey this year. One requested the average number of years to receive a Ph.D.(5.014). The second asked for the number of positions left unfilled last year in the following categories: tenure-track (156), researcher (0), post-doc (5), lecturer (9), instructor (8), other (4). We expect to use this additional data in a long-term longitudinal analysis.

Degree Production (Tables 1-6)

A total of 933 Ph.D. degrees were awarded in 1998 by the 144 responding departments. This is up 4.5% from the 893 awarded in 1997, reversing a downturn from 915 the previous year, but still short of the record 1,113 in 1992. The prediction from last year's survey that 1,037 Ph.D. degrees would be awarded in 1998 was, as usual, overly optimistic, but this year the discrepancy was only 10% as opposed to 20% last year. Using an optimism factor of 0.85, next year's prediction of 1,128 translates to approximately 959 new Ph.D.s in 1999 (Figure 1).

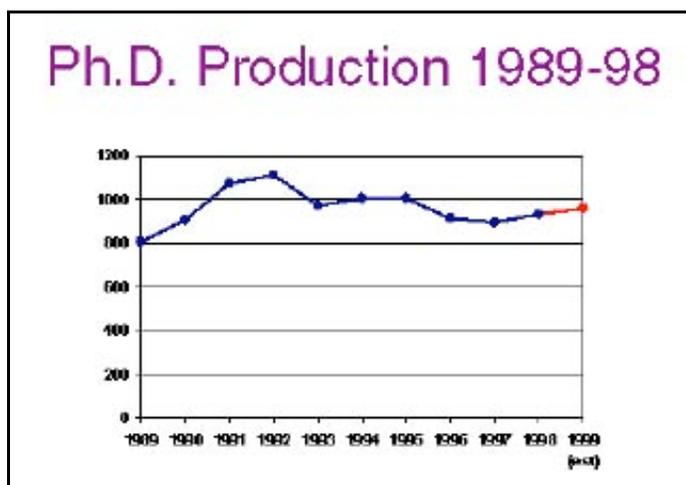


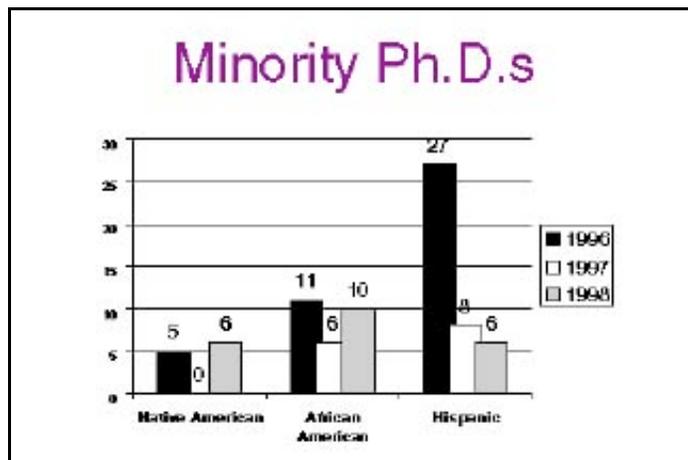
Table 4 shows areas of specialization versus types of first appointments for last year's Ph.D. recipients. The breakdown is quite similar to last year with no discernable new patterns.

As predicted, the explosive growth in undergraduate enrollments over the past two years has begun to translate into a significant increase in the number of new Bachelor's degrees awarded. There were 10,161 awarded in 1998 by the 138 responding departments, up 26% from the 8,063 awarded by the 129 responding departments in 1997. The number of Master's degrees, which was essentially flat between 1995 and 1996 with 130 departments reporting, rose about 4.3% in 1997 with 131 departments reporting, and rose again about

11.1% in 1998 with 140 departments reporting.

The ethnicity statistics for bachelor's and Master's degree recipients remained relatively static. Although the absolute numbers of Bachelor's, Master's, and Ph.D. degrees awarded were significantly higher than last year, the percentage awarded to women in all three categories remained constant.

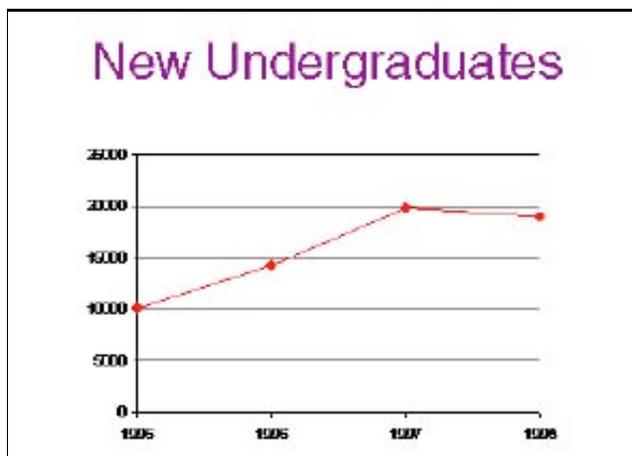
Last year we noted an alarming drop in the number of Ph.D. degrees awarded to Native Americans (from 5 in 1996 to 0 in 1997), African Americans (from 11 in 1996 to 6 in 1997), and Hispanics (from 27 in 1996 to 8 in 1997). This year these trends were reversed in the first two categories, but not in the last: there were only 6 Ph.D. degrees awarded to Hispanics in 1998 (Figure 2).



Student Enrollment (Tables 7-14)

New enrollment in Ph.D. programs is up significantly this year: 1,780 in Fall 1998, up 23.6% from 1,440 in Fall 1997. This is the third straight year of increase, indicating a sustained trend. These numbers bode well for a long-term increase in Ph.D. production. Total enrollment in Ph.D. programs is 7,119, up 4.86% from 6,789 last year. New enrollment in Master's degree programs shows a similar gain from 3,410 in 1997 to 4,223 in 1998, an increase of 23.8%.

The recent precipitous rise in undergraduate enrollments appears to have leveled off, at least for the moment (Figure 3). After doubling in the two years between 1995 and 1997, new undergraduate enrollments in CS and CE are off 4.2% this year.



The percentage of women enrolled in Ph.D. programs has shown a gradual but steady increase over the past three years: 16.2% in 1996, 17.0% in 1997, 18.8% in 1998. There were no significant changes in the ethnicity of Ph.D. students.

[Faculty Demographics \(Tables 15-23\)](#)

In 1998, about 10.8% of professors were women, up slightly from 10.2% in 1997. Although this is not much of a change, women have shown significant gains in seniority. For men, the percentage of tenure-track faculty who were associate or full professors was 79.9% in 1996, 82.2% in 1997, and 81.0% in 1998, essentially a steady state. Women, on the other hand, went from 58.0% in 1996 to 61.6% in 1997 to 69.1% in 1998.

[Faculty Salaries \(Tables 24-32\)](#)

Average salaries at U.S. institutions rose 3.7-4.8% with the smallest increase at the full professor level and the largest at the associate professor level (Table 30). This is slightly higher than last year. Canadian salaries posted more modest 3.9% and 2.2% increases at the assistant and associate professor levels, respectively, and actually dropped 0.6% at the full professor level (Table 32). Salaries for U.S. institutions are 9-month salaries and are reported in U.S. dollars; those for Canadian institutions are 12-month salaries and are reported in Canadian dollars.

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

The overall mean salaries reported in the center column in Tables 24-32 are unweighted means, calculated by averaging the mean salaries as reported by each department. They are not weighted by the number of CS & CE faculty at each institution.

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 12 schools in this ranking are Stanford University, the Massachusetts Institute of Technology, the University of California at Berkeley, Carnegie Mellon University, Cornell University, Princeton University, the University of Texas at Austin, the University of Illinois at Urbana-Champaign, the University of Washington, the University of Wisconsin at Madison, Harvard University, and the California Institute of Technology.

The departments ranked 13-24 are Brown University, Yale University, the University of California at Los Angeles, the University of Maryland at College Park, New York University, the University of Massachusetts at Amherst, Rice University, the University of Southern California, the University of Michigan, the University of California at San Diego, Columbia University, and the University of Pennsylvania.³

The departments ranked 25-36 are the University of Chicago, Purdue University, Rutgers-the State University of New Jersey, Duke University, the University of North Carolina at Chapel Hill, the University of Rochester, the State University of New York at Stony Brook, the Georgia Institute of Technology, the University of Arizona, the University of California at Irvine, the University of Virginia, and Indiana University.

Acknowledgments

Stacy Cholewinski and Jean Smith assisted with the data collection. Stacy also handled the data tabulation and Jean helped follow up with the institutions. We thank them for their assistance.

Footnotes

In Table 1, the "Ph.D.s Produced" column shows the number of CS and CE degrees produced throughout the rankings.

* Includes 35 CE degrees granted by these CS departments

@ Includes 1 CE degree granted by these Canadian departments

Includes 18 CS degrees granted by these CE departments

+ Includes 62 CE degrees granted by these CS departments
& Includes 20 CS degrees granted by these CE departments

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 from 1970 until 1984.

2 In some instances, departments only answered selective questions within a table or a section. Therefore, for individual fields within tables the response rate may vary + 3.

3.Indicates that the percentage only totals 99.

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.

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

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

All faculty tables: The survey makes no distinction between faculty specializing in CS versus CE programs. We tried to minimize inclusion of any faculty in electrical engineering.

Editor's Note: Computing Research News will publish updated enrollment figures in their March issue. For additional information, please visit: <http://www.cra.org/CRN/>.

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An Interview with Dr. Meera Chandrasekhar

*By Virginia Van Horne
MGE Senior Research Associate*

Each issue of Making Strides features a short interview with an underrepresented SME minority professor who has been instrumental in mentoring and encouraging students through all levels of the education pipeline, as well as demonstrating leadership and outstanding accomplishments in the world of SME.

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I had the opportunity to chat with Dr. Meera Chandrasekhar, a Professor of Physics at the University of Missouri-Columbia. A winner of the 1999 Presidential Award for Mentoring in Science and Engineering, Dr. Chandrasekhar conducts research on condensed matter physics and optical spectroscopy of semiconductors, superconductors and polymers, specializing in studies in high pressure. She obtained her Bachelor's of Science degree from M.G.M. College in Udupi, India in 1968; her Master's of Science from the Indian Institute of Technology in Madras, India in 1970; and her Ph.D. in Physics, "The Effects of Uniaxial Stress on the Electromagnetic Reflectance Spectrum of Ge and GaAs," from Brown University in 1976. After completing a postdoctoral fellowship at the Max-Planck-Institute in Stuttgart, Germany, she came to the University of Missouri-Columbia, where she is currently a full professor. In addition to her research and teaching, she has written close to 95 reviewed articles and has developed hands-on physics programs for elementary and middle school students and teachers.

How did you become interested in science?

Good question! All of this happened so long ago, I have to think back. As a child, I was always very interested in science. But, the thing that set it all off was a wonderful teacher in my first year of college. I attended college in India in the small, rural town of Udupi. In India, one attends a

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rather small (in terms of size) institution in order to obtain their bachelor's and then moves on to a larger institution for further study. This one particular teacher I had was absolutely great. His method of teaching was so clear, and he always expressed such enthusiasm. Everything he said made sense, and it connected with the outside world.

There was no looking back after that! I was also fortunate to be able to participate in a series of month-long summer institutes via a national scholarship I had received my first year of college. As the institutes were held at different colleges or regional labs across India, I was able to interact with students of all levels and all cultures.

Tell us more about your education in India.

College tuition in my day was extremely cheap. To give an indication, my monthly food bill was about half of my annual tuition! The Indian Institute of Technology was a government sponsored institution. The master's degree course was mostly based on coursework. We had to complete a small research project, but there was not as much of an emphasis on research as there is here in the United States.

Even as an undergraduate student at M.G.M. College in Udupi, I began to think about continuing my education beyond the bachelor's degree. My family was very supportive, but it was clear to me that I had to be an outstanding student, as being a woman would put external pressures on me-primarily to get married early. I graduated from M.G.M.

College in 1968 and completed my master's degree in physics at the Indian Institute of Technology. After that, I knew that I wanted to obtain my Ph.D. and specifically, I wanted to do a Ph.D. in experimental physics. I realized that I would have access to better equipment, facilities, etc., if I attended an institution outside of India. I applied to several institutions, but was very interested in Brown University.

Why Brown?

My uncle was a physicist and worked for a company near Brown University. He had obtained his doctorate from a university in Germany. He was the first in my family to have pursued a career in the sciences. My father was a career army officer, my mother was a homemaker and my grandmother was a teacher.

I applied to and was accepted at Brown University. I obtained my Ph.D. in physics in 1976.

Did you encounter any obstacles as a student?

When I went to college, (it was the late 1960's, early 1970's), women were just entering into the SME fields. In India I was always aware that I had to watch out for myself. Many of the women who are the senior scientists in India now are people of my generation. In order to succeed, we knew we had to be extremely good (academically) so no one could question us. We also believed that family members should not put pressure on us. We were a transitional generation.

What about at Brown?

There were very few women at Brown. Three out of 100 graduate students were women. This was consistent with the national average that was running between two to three percent at that time. When I began my Ph.D. studies there were two other women. One switched to medical school after one semester and the other obtained employment when she received her master's.

For one year I worked as a teaching assistant, and then did research. Students had to go around and visit professors, searching for a thesis advisor. When I did this, I got mixed reactions. Some professors were very kind, others were not. Also, from a cultural perspective, I found it particularly difficult to approach these professors. In India, the professor is given more respect and interactions are more "at a distance." I always felt as if I was intruding on their time. I realize now that that was not the case.

I eventually "found" a thesis advisor. He was a wonderful man named Fred Pollak. He was both positive and extremely encouraging. In hindsight, I realize that I was rather naive and somewhat unaware. Unless something was rather overt, I didn't notice it. For example, while at Brown, I remember going to one of the professors and asking him about his research program. His response was quite curious to me. He asked me why I was even asking about his research since in all likelihood I would quit when my husband moved. I explained that I was single. It was as if he didn't even hear or understand me. The professor responded, "well, in that case, you're single now, but you'll still get married and move." I couldn't understand the absurdity of it all. I remember discussing this incident with a post doc some years later, and he assured me that that particular professor was rude to everybody. I realize now that I was probably in denial, accepting unpleasant incidents as freak incidents or attributing it to somebody's bad mood.

What did you do once you received your Ph.D. in 1976?

I went to Stuttgart, Germany for a postdoctoral position at the Max-Planck Institute. Fortunately, I made a deal with them, explaining I would take two months off in order to learn German. This provided me with a break from studies!

I worked at the Institute there for two and one-half years. While there, I met my husband. He, too, is a physicist. He got a faculty position at the University of Missouri, Columbia, so I followed him.

And, then?

I didn't have a faculty appointment when I got here; however, the department was aware that I had a physics background. For about the first five years, I held temporary positions, such as research associate and visiting professor. In 1983, I officially joined the faculty as an assistant professor. I was an assistant professor for a few years and then was promoted to associate professor in 1986. In 1988 I became a full professor.

Why academia?

I have always had an interest in teaching. I truly enjoy it. When I was at Brown, I worked as a teaching assistant for one year and had a good time. It had always been in the back of my mind to go into the academic profession.

You also received a Presidential award for Mentoring in Science and Engineering in 1999. Were you surprised?

Yes I was. I knew I had been nominated, but getting nominated is one thing. Actually receiving an award is quite another! I think a large part of this award stems from my work with K-12 students. I really want to get young women interested in the physical sciences.

How did you become involved with students at the K-12 level? Would you say this is a passion of yours?

The passion is getting young women interested in the physical sciences! And, building their self-confidence. One of my major efforts began in 1992 when I collaborated with Becky Litherland, the science coordinator for the Columbia, Missouri school district. With funding from the National Science Foundation, we began an after-school program centered on physics for elementary and middle school female students. This entailed developing a lot of activities that were

both fun and usable by young children.

Working on this project reminds me of my own feelings as well as experiences as I pursued my studies of physics. I, too, did not have the right kind of opportunities, or knowledge or confidence in pursuing a male-dominated field such as physics. The sheer act of working in physics-using your knowledge and building your confidence-is extremely beneficial. Sometimes women will be academically more qualified and will actually perform better than men, yet that does not translate into their perception of being good at the physical sciences. Female students seem more intimidated when they encounter simple equipment, largely because their life experiences may not have included using shop tools or devices such as voltmeters. Their male counterparts, in contrast, appear thoroughly confident, giving the females the feedback that they may not excel in the physical sciences, even if their grades tell them otherwise.

There are other factors: a lack of mentors is one of them. Female students need to see women active in traditionally male fields, so they do not think they are going to be the only females in the class or in the workplace. The number of women is increasing, so that the "onlyness" may not be a factor in many areas. However, the numbers are still disproportionately small in the physical sciences, particularly in physics, engineering and computer science. Yet other studies have documented that female students want to go into professions that do good for mankind.

Female students frequently express the desire to go into fields where they can "help" people, and often see physical science-oriented professions as being less person-oriented. Medicine and biology, in contrast, are more obviously person-oriented. Yet it is the physical sciences that produce a lot of value-added to the quality of everyday life, a factor that may not be obvious to the students.

Do you work with all types of students?

Yes, I've taught and worked with all types of students-from freshman to graduate students to postdocs. I have a pretty active research program; my specialty is to do studies under high pressure. I typically have one or two graduate students and sometimes a postdoc working on my research.

Here at Missouri about 15-25% of the SME students are a physics student. I have all types of students-male, female, foreign, U.S.-coming to talk to me. Our department is fairly small. There are 20 faculty members and 40 graduate students. Because of this, we tend to meet all of the students.

Like elsewhere in the country, about 50% of the physics faculty are foreign nationals and 50% are U.S. citizens. There is another woman faculty member in the physics department; she also has an appointment in the chemistry department.

What advice do you give to your university students?

I advise students on the importance of remaining focused. It is imperative "to keep your eye on the ball." Physics is a difficult subject-just like any type of graduate course-and there are times when a student can get discouraged. If you can see your way out of the hole, then you've already made strides. I also stress the importance of studying with and interacting with other students.

I always let my students decide what they want to do when they graduate. Most have very strong feelings one way or the other-whether to go into academia or industry. It really is dependent upon the person.

Thank you Dr. Chandrasekhar. For information on the extracurricular programs, please visit <http://web.missouri.edu/~wwwepic/index.html>.

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Making Strides is a free,

**Some Valuable Lessons Can Be Learned from the
Strategies of Winning Football Coaches (And
They Just May Work for ST&E Graduate
Students Too!)**

By Jay W. Dull, Interim Executive Director of the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) and Human Resource Manager for the Ford Motor Company

We enter the new millennium with on-going dialogue about the lack of underrepresented minorities in almost every area of science, technology and engineering (ST&E). The number of minorities graduating each year with advanced degrees in science and engineering is disappointingly small. Almost four decades ago, affirmative action became the law of our land, to help assure equal opportunity for minorities and women. But, we enter a new century still wrestling with issues of "exclusion" and still seeking ways to increase the number of underrepresented minority students achieving ST&E degrees.

The Twentieth Century closed with Time Magazine proclaiming a scientist, Albert Einstein, as the person of the Century-the individual whose achievements had the most significant impact on our world. What his achievements and those of many others did to further science and technology, and to put our nation in a position of technical leadership, is remarkable. However, we enter this new century at risk of losing that technical leadership. One reason is our continuing failure to optimize our most important resource-the minds and inquisitive spirit of talented young people. How can a nation, which expanded the boundaries of technology so rapidly and forcefully in the Twentieth Century now, find itself facing a potential shortage of the essential ST&E talent needed in this new century?

Senior government officials met last year in Washington, DC with representatives from twelve high-tech companies to discuss how the federal government and industry could work together to assure a strong ST&E workforce. They concluded

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that to help assure a strong ST&E workforce, our nation must expand opportunities for minorities, women and disabled persons. A subsequent meeting of people involved in ST&E minority educational programs generated the following recommendations: mount a public awareness campaign stressing the importance of math and science education; foster mentoring of students interested in ST&E careers; and, mount an attack on the underlying causes of the low representation of minorities, women and disabled persons in the ST&E workforce. If we could rapidly implement these recommendations, it certainly would help develop the talent we must have to continue our nation's preeminence in science and technology. But such change does not come easily and unfortunately it does not come quickly. Efforts during the past four decades have resulted in only a modest increase in minority representation in the ST&E workforce. While we work for systemic change, we would be well served to look for simple and quick ways to effect changes that could immediately enhance the educational process for current and future students.

During the past year I had the opportunity to travel to several college campuses to engage small groups of graduate (Ph.D.) students in discussions about their perception of the educational process, and to find out, from their perspective, what is working well and what is not. The comments of one student made a lasting impression on me. As he talked about what prompted him to pursue a Ph.D. program, he was exceptionally enthusiastic and pleased with the experience. He felt valued and he felt good about himself. He told me he was aggressively recruited in much the same manner that a star football player would have been recruited. University alumni had encouraged him to attend and pursue studies at their alma mater. They encouraged him to visit the university and meet the people. When he visited the university, key people such as deans, faculty department heads and others, took time from their busy schedules to talk with him. He left the university with the impression that they really were interested in him and wanted him at their university. This student's comments started me thinking that perhaps there is something to be learned from the methods successful college football coaches use to attract and retain top talent. A bit of time spent talking with a university football coach could help us form some winning strategies to attract and retain more minority ST&E graduates.

Identifying and Recruiting Talent

Do you know of a successful football coach who doesn't have a network of alumni constantly on the lookout for new talent? Why not harness the resources of alumni who

completed their studies at your university, and make them your scouting staff? Think of the impact on a student when Dr. X calls and indicates that he/she has heard about the student's talent and abilities, and would like to talk with him/her about considering good old Alma Mater U. I know a similar approach certainly worked for one student I met, and I have to believe there are many more who would respond to the same type of personal touch. It does not take a million dollars or a lengthy study to implement this approach. Just do it!

To the Team-the Team- the Team!

Think for a moment what changes may be possible if deans and university presidents adopted some of the strategies and tactics college coaches use and applied them to graduate studies programs. Coaches constantly stress that there is no room for individual heroes. Everything is done for the team.the team. the team! I have been told that some academic communities are so divided by parochial interests that there is absolutely no sense of being an academic team- a group of people actually committed to the process of developing scholars and faculty for the future. Imagine the energy that could be focused on educating graduate students if we focused on developing a sense of team academe. Perhaps it is time to begin putting a higher premium and reward on faculty performance that contributes to academic teamwork and teaching. The perceptions that a number of Ph.D. students have shared with me over the past year suggest that at some universities the environment is so focused on research and fundraising that there is little or no time devoted to student development.

Care and Feeding

Every year millions of dollars are spent on tutorial services for student athletes. I am not suggesting that graduate students should have tutorial services made available to them. However, several students told me it would have helped to have an officially sanctioned "support group" to which they could turn to when things got rough. As one person put it, "Just having someone to talk with and share experiences with would help". How much effort would it take for faculty and administration to become proactive and to launch and fund a support group for graduate students?

Millions of dollars also are spent each year on athletic training tables. I certainly am not suggesting we consider establishing a training table for graduate students. But if you stop and realize that the athletic training table not only provides nourishment, but also provides a sense of

camaraderie for the team, why not adopt a similar approach for graduate students? Establishing regular luncheons or dinners where students could share conversation and experiences and trade "academic war stories" may be an excellent team building tool. Yes, students do this informally, but think of the impact such a program might have if it were sanctioned and fully supported by the faculty and university administration. Not a million dollar solution, but a very low cost, affordable approach which sends a message to the students that we care!

While government officials, professional organizations, university administrations and others address the issue of how to implement systemic change and increase minority representation in the ST&E workforce, I believe there are simple things we can do to encourage young people currently in graduate programs to stay the course and complete their programs. I also believe that with some rather simple, but improved support mechanisms, we just might retain some of the promising students who begin graduate studies and do not complete the program.

The struggle to implement systemic change that will significantly improve the number of minorities completing ST&E graduate programs is likely to involve more dialogue, more studies and yes, more political debate. While that struggle continues, let's not overlook the obvious, simple, low-cost things that we can do NOW to improve the environment and educational process for current graduate students. If you haven't recently talked with a group of graduate science and/or engineering students about the simple things which could be done to improve the educational process for them, I encourage you to do so. They have some excellent and very affordable ideas that could be quickly implemented to improve the process. Some very valuable lessons also can be learned from looking at the strategies winning college football coaches use, and similar strategies just may work to encourage more ST&E graduate students to seek and complete their graduate degrees.



**Research
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In this issue:

[Ph.D. Enrollment in
Computer Science Up
for the Third Straight
Year](#)

[An Interview with Dr.
Meera Chandrasekhar](#)

[Some Valuable
Lessons Can Be
Learned from the
Strategies of Winning
Football Coaches](#)

[A Profile of an MGE
Institution:
Rice University](#)

[From the editors](#)

**Managing
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George
Editor:
Virginia Van Horne
Art Director:
Ann Williams

A Profile of an MGE Institution: Rice University

By Jordan Konisky, Vice Provost for Research and Graduate Studies and Professor of Biochemistry and Cell Biology at Rice University

Can a small, department-based model of minority Ph.D. education be diffused across a whole university? Can it be replicated at a large public university? Rice University, with an enrollment of approximately 650 graduate students in its Schools of Engineering and Natural Sciences, is small in comparison to most major research universities. Yet, Rice's Department of Computational and Applied Mathematics (CAAM) has been a national leader in producing underrepresented minority Ph.D.s in mathematics. \

The Rice Minority Graduate Education (MGE) program builds on the successful CAAM model as developed over several years by Professor Richard Tapia, a nationally recognized leader in undergraduate and graduate education. The goal of the Rice MGE program, which we designate locally as the Diversity Graduate Program in Science and Engineering, is to diffuse the Tapia/CAAM model across Rice and to the College of Engineering of the University of Wisconsin, an institution which is ten times larger than Rice. Our goals are to both increase the production of minority Ph.D.s, and most importantly, to foster the development of future role models and leaders.

A major function of the Rice/ Wisconsin MGE is to help each graduate program identify underrepresented minority students with a high potential for success in graduate work. MGE program personnel, including faculty and students, attend local, regional and national graduate fairs, professional meetings and other events looking for potential students. While the ultimate decision to accept a student resides with the department, the Rice MGE program actively advocates for students that we identify as matching well with program objectives. Students may apply for admission

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through either the MGE program or the department of interest.

In general, graduate departments seek students with a demonstrated aptitude for carrying out research, and, for the most part, use a traditional set of criteria that they believe is predictive: research experience, letters of recommendation and test scores. While there is general agreement that students with low scores will not succeed, we all know of students with moderate scores (50-70 percentile) who have completed their Ph.D. and gone on to productive professional careers at research universities, colleges, industry and government. In every case, these students have been dedicated and persistent, qualities that are not always obvious in application materials, especially for students with no research experiences. A major goal of the Rice MGE program is to gain a further understanding of a fuller range of predictors for success in graduate school and to ensure that each predictor is given appropriate weight in decision-making.

Rice is within the purview of the Fifth United States Circuit Court of Appeals, and therefore all activities must fall within the constraints of "Hopwood." In March 1996, the Court opinion in the case of Hopwood vs. Texas held that affirmative action programs in matters of higher education admissions are a violation of Federal law. In Texas, that ruling was subsequently extended in an opinion by State Attorney General Dan Morales to also encompass financial aid programs based on race. Our challenge has been to design a program that promotes minorities' admission and support, yet remains within the confines of the law. Rice grants MGE fellowships based on the full range of predictors alluded to above plus a demonstration (through an essay and interview) of the fellows' potential and commitment to promoting diversity both at Rice and throughout their careers.

Every Rice MGE Fellow is guaranteed a three-year fellowship and tuition waiver. At the end of three years, support is shifted to departments, which is the traditional method of graduate support at Rice. Thus, upon entering Rice, MGE students can count on stable funding for the duration of their Ph.D. studies. MGE students are also provided with travel funds to attend professional meetings, workshops and conferences.

Retention of minority students to the Ph.D. is another critical challenge that can be realized by creating a community that recognizes and values diversity and provides a supportive structure for students. At Rice, retention activities center

around three interdepartmental faculty-led cluster groups: 1) Computer and Mathematical Sciences, 2) Bio- and Earth Sciences, and 3) Chemical and Physical Sciences. The College of Engineering at UW-Madison functions as a fourth. The cluster group provides each student with a social network and a support community. Thus, students are not left to fend for themselves as perhaps the only, or one of a few underrepresented minority students in a research group, but are part of a larger community of students with similar professional aspirations, and, perhaps, problems.

MGE students share social events, study groups, professional development workshops, national professional meetings, and assist in the recruiting of students to the program. They also serve as mentors in the MGE summer undergraduate program and as role models to students who are less advanced in their graduate studies. MGE students also regularly tutor K-12 students.

Returning to my opening questions, the challenge will be to convince our colleagues that there is an untapped pool of talent that, given sufficient support, can take their rightful place as scientists and leaders. Our MGE program can and will show them the way.

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