Mason's Female CS Faculty Shed a Bright Light on a Disturbing Trend

Anyone working in Computer Science these days can see that there just are not as many women in the field as in the past. In the academic world, this is true for both students and instructors. There is an overall drop in the number of CS degrees awarded nationwide. The US National Science Foundation reports that the numbers have declined from an all-time high of 42,000 CS degrees awarded in 1986. According to the Computer Research Association's annual Taulbee Survey of CS degrees, fewer than 8,000 new undergrads enrolled in CS programs in fall 2007. The 2007-2008 survey states, "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."

Dr. Carlotta Domeniconi

Why So Few Female CS Students?

An entire publication, the *Journal of Women and Minorities in Science and Engineering*, is devoted to exploring the lack of diversity in CS. *Computing News* spoke with the journal's editor-in-chief, Dr. Carol Burger, an associate professor at the Center for Interdisciplinary Studies at Virginia Tech, about the statistics. She reports that the problem goes beyond the classroom. "We've seen a worldwide decrease in CS

Dr. Pearl Wang

In addition to Mason's strong course offerings, we provide students something more: a committed faculty that encourages both men and women in Computer Science.

majors, both male and female, and CS departments in many European countries are closing their doors." The environment has changed since the glory days of the late '80s: "Computer science has an image problem," says Burger. "Traditionally, women look to enter fields where they can have a positive impact. There is a misconception that all CS majors do is sit alone working late hours coding. There needs to be better outreach at the high school level to schools, parents, and students about what can be

Mason's Female CS Faculty, from page 1

done with a CS degree and how well-paying the career can be." Dr. Burger also feels that high school CS teachers need more training to understand that girls view CS differently from boys and need a different type of encouragement.

Mason Under the Microscope

Mason's female Computer Science faculty echo Dr. Burger's sentiments about student recruitment. Associate Chair for Undergraduate Studies Dr. Pearl Wang, a 25-year veteran of the department, says, "It would be helpful to work directly with high schools to develop educational activities and opportunities where

Professor Tamara Maddox

girls could become involved with our Volgenau School activities, such as the gaming or robotics clubs." Dr. Wang reports that there were four female Applied CS degree majors in fall '08 out of 11 total students, and 33 female Computer Science majors out of 339.

Mason CS assistant professor and alumna, Tamara Maddox, has been at both ends of the trend. As a CS major in the late 1980s, her classes at Mason were full of women. But today, as a CS professor at Mason, she says she teaches only a handful of women. Maddox feels women bring an important skill set to the profession and also have a lot to contribute. Her own career serves as an example. She

Dr. Yutao Zhong

earned her BS from Mason and worked in the computer industry for several years before going to law school. She ran her own law practice for several years, until "I missed the technology." At the time, technology law was in its infancy and there was no opportunity to combine her technical and legal skills in a career. She headed back to Mason for graduate CS courses. The department was looking for someone to teach computer ethics, and she fit the profile. "Coming to work for the CS department was like coming home," she says. "There was a lot of respect for the work I was doing, and they gave me the freedom to develop the ethics program."

Outside the classroom, female majors are making great strides. Mason faculty agree that the women are treated as peers when they travel to conferences and present papers. Faculty report that female students choose Mason because of its competitive program, expert faculty, and a great location. There are a lot of opportunities in our own backyard.

"There is still a lingering stereotype that women aren't as proficient as men in this field," says Mason Assistant Professor, Dr. Amardu

Dr. Jessica Lin

Shehu. "We always say that women have to be twice as good to be considered equal to men…I believe that it is much harder being a woman of mediocre skills in computer science as opposed to a man of mediocre skills. On the other hand, there is a

Dr. Amardu Shehu

lot of support and pride from women who see other women fight to become successful." That success can make a difference when women walk into class and see a female instructor.

Dr. Shehu says that one way to involve women is to have them participate in the Grace Hopper conference that celebrates women in engineering. And she suggests women should be encouraged to participate in the REU (Research Experience for Undergraduates), which attracts both women and men to research. Nonetheless, she admits that these activities are time-consuming and require a dedicated person to organize the logistics.

A Student's Perspective: CS Not Just for Guys

Emily Vorek, a Mason CS sophomore, says, "I think that sometimes women feel that CS is 'only for guys,' and that dissuades them from doing it. I also think that society at large does not encourage women to pursue technology careers to the same degree that it encourages men to do so. For example, the stereotypical

'computer nerd' in pop culture is almost always male. Furthermore, female computer scientists do not tend to be as well-known as their male counterparts."

> Emily is part of a generation that doesn't see the difficulties in terms of gender. "Never let anyone tell you that you cannot pursue computer science because you are a woman."

Like many students, Emily started with games and then wanted to learn how the hardware and software worked. But her interest goes farther; she wants to solve crimes using computer forensics. She sees beyond the classroom to a career that uses her programming talents as part of a package of skills.

Emily is part of a generation that doesn't see the difficulties in terms of gender. She says, "Computer science is a challenging field. Yes, there are a lot of men in the computer science field. That doesn't mean that it's only for men. Never let anyone tell you that you cannot pursue computer science because you are a woman."

Emily Vorek

Dr. Jana Kosecka

Mason's Women Buck the Trend

The future of Computer Science isn't all bleak. The Computer Research Association reports that "total enrollment per department by majors and pre-majors in U.S. computer science programs is up 6.2 percent over last year…. the total PhD numbers are up 5.7 percent." The Mason CS incoming class was up 20% over the previous year.

> ▼ MASON CS Women By the Numbers:
>
> 8 Full-Time Faculty Members:
> Carlotta Domeniconi
> Jessica Lin
> Tamara Maddox
> Jana Kosecka
> Amarda Shehu
> Pearl Wang
> Elizabeth White
> Yutao Zhong

Mason's female faculty report that they like the support they receive from their peers — both male and female — and the fact that the University has changed, too. Dr. Wang says, "When I started, it was

difficult for women on tenure-track appointments to consider having children. This has changed considerably in recent years." Now Mason's CS department boasts eight full-time female faculty. Three of our female faculty, Dr. Carlotta Domeniconi, Dr. Jana Kosecka and Dr. Elizabeth White have received the coveted and prestigious NSF Career Award. Liz White also received the Volgenau School Outstanding Teaching Award.

In addition to Mason's strong course offerings, we provide students something more: a committed faculty that encourages both men and women in Computer Science. With professors like Pearl Wang and Tamara Maddox — along with our

Dr. Elizabeth White

newest female instructors, our faculty shows students that there's opportunity in CS for everyone. They are no ordinary working women; they are published experts, award winners, and dynamic researchers who raise the bar every day for their colleagues and their students.

The CS Department's MS in Information Systems and MS in Software Engineering are seeing an increase in female students. Mason's location in Northern Virginia's booming high-tech corridor is a great place for professional women to come to study and continue their technology careers.

CS Department's New Computer Game Design Concentration is a Winner

Learning computer languages and compiling lines of code may not be considered creative until you see that the outcome is an action-filled game. Computer game design and programming is at the heart of a multi-billion-dollar industry, with the United States at its center.

One of the first steps Dr. Morgan took when he came to Mason was to ask a local Fairfax-based studio, Mythic Entertainment, to advise students on their careers and provide feedback on their projects.

Game design courses were added to the Mason CS curriculum in fall 2008, part of the BS in Applied Computer Science concentration. Though still new, about 70 students have enrolled in classes taught by Prof. Graham Morgan. He says, "Students taking the game design concentration must complete the main courses associated with a Computer Science degree and they graduate with the rounded knowledge of a computer scientist with the expertise in video game creation." The cross-disciplinary program also encompasses design work, including courses offered by the Department of Creative and Visual Performing Arts.

In addition to being fun, the gaming concentration allows students to develop marketable skills. The core element of a video game – an interactive graphical simulation presented in real time – is equally

useful and highly desirable in other fields, including aerospace, e-commerce, and the military. Programmers with the appropriate skills can expand their work beyond gaming, increasing employment opportunities after graduation.

Dr. Morgan's work in distributed systems has included projects and published papers on online game technologies. Some of his doctoral students have gone on to build physics engine technologies for game studios. He collaborated with leading video game studios in the United Kingdom to develop courses at Newcastle University.

One of the first steps Dr. Morgan took when he came to Mason was to ask a local Fairfax-based studio, Mythic Entertainment, to advise students on their careers and provide feedback on their projects. "This type of industry involvement is key to success," says Dr. Morgan, citing the effect of encouragement from established professionals in helping students transition from class projects to careers.

Jon Morton

Two of the many students who benefited from interaction with Mythic were junior computer science majors Jon Morton and Billy Monks.

Morton, a longtime gamer says, "It's the best of times and the worst
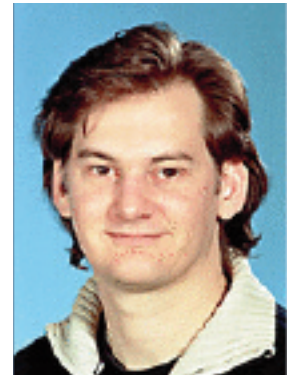
Dr. Graham Morgan

of times for being a gamer. There are so many games to play and not enough hours in the day (or night) to play them all."

Both students have long harbored ambitions of creating video games, and both noted that doing so requires a broad array of programming skills as well as an appreciation for visual effects. "Even though it may sound silly, a big consideration of a game's success nowadays is watchability," notes Morton. Monks adds that his favorite games are "ones that immerse you in their own world."

At the end of the fall semester, student project games were made available to students who wanted to play them and for review by designers from Mythic Studios.

Monks' "The Rather Exciting Adventures of Wondercat," was voted best game by students last semester. Monks describes it as 'a beat-em-up' game in the style of Double Dragon and Teenage Mutant Ninja Turtles, adding "I was amazed to see the students playing my game and having fun. It was a huge confidence boost. Mythic Entertainment provided invaluable professional perspectives which I had never experienced before."

Morton's game, "Traffic Flow," presented the challenge of creating something that was fun to play but simple enough to implement within a semester. Morton says, "I learned

▼ CS Research Update

Mason Faculty Traveling the Globe, Securing New Funding Sources, and Publishing Findings

The CS faculty is on the move again with an impressive list of accomplishments. We congratulate our department. For more listings please visit our Website: cs.gmu.edu

New Grants and Contracts Awarded

Dr. Daniel Menascé, Senior Associate Dean, reports that he and his colleagues have been awarded an NSF grant: "SASSY: Self-Architecting Software Systems," NSF, PI: Daniel A. Menasce, co-PIs: Hassan Gomaa, Joao Sousa, and Sam Malek, $400K for two years.

Dr. Angelos Stavrou

Dr. Angelos Stavrou reports that a recent government-funded research project "A Security Architecture for Information Assurance and Availability in MANETs" appeared in the *IEEE Conference on Military Communications (MILCOM '08)* in November 2008. "In this work, we attempt to protect mobile ad-hoc networks against network borne attacks and locally run malware using node-based defenses that isolate critical services preventing them from becoming compromised."

Dr. Duminda Wijesekera

Stavrou also reports that with Professors Duminda Wijesekera and Michael E. Locasto, "We have received seed funding from the IT&E school to pursue solutions that will promote health-care security. These security solutions will abide by the National Standards and will facilitate the fast exchange and process of medical information." The title of the seed grant is: "Secure, Patient-Specified Policy-Based Dissemination of Health Records", Bioengineering Seed Grant, Volgenau School of Information Technology and Engineering.

Books Published

J.X. Chen and C. Chen, *Foundations of 3D Graphics Programming Using JOGL and Java 3D*, Second Edition, Springer Verlag, New York, ISBN 978-1-84800-283-8, 2008. (386 pages)

J.X. Chen, *Guide to Graphics Software Tools*, Second Edition, Springer Verlag, New York, ISBN 978-1-84800-900-4, 2009. (590 pages)

For more details about faculty publications, visit http://cs.gmu.edu/

how to structure a program in a way that isolates specific aspects of the game from each other like: gathering user input and changing the state of things in the world (traffic lights); determining if each car should speed up or slow down in response to red or green lights and what the cars ahead were doing; detecting collisions; and calculating the flow of traffic and updating the score based on how well things are moving."

Both Morton and Monks have more games in the works, and both are interested in creating games professionally. For other students curious about the gaming concentration, Morton says, "Prof. Morgan's class is by far the closest thing to what writing software in the real

Billy Monks

world is like. From the outset, you won't know in detail what you'll be building or exactly how to build it. But, if you persevere, you can succeed and will have a working game to show for it." Monks adds, "It's definitely been one of the most rewarding experiences of my college career, and I'm sure a lot of other students will feel the same way."

Learn more about Mythic Entertainment: http://www.mythicentertainment.com/ Learn more about the CS gaming concentration at: http://cs.gmu.edu/programs/undergradua te/acs/BSACSGameBrochure.pdf

Back to the Classroom: Teaching Brings Rewards for Mason Alums and Their Students

After being awarded an advanced degree, leaving school once and for all may be irresistible. Nonetheless, many Mason alumni return to the classroom as instructors. The former students profiled below had CS Department faculty as advisors.

Dr. Brian Blake

M. Brian Blake (PhD in Information Technology, 2001), Associate Professor and Chair of the department of Computer Science at Georgetown University, didn't plan to teach. Before and during his Mason studies, he worked for several consulting firms. Then, in 2000, he taught a course as an adjunct at Georgetown University. Enthralled by the students, he joined Georgetown's faculty, receiving tenure in 2005. This summer he'll become a tenured Professor of Computer Science at the University of Notre Dame.

Although he might consider temporary service in industry or the government, Dr. Blake considers himself an academic. "Teaching," he says, "is the best of all worlds." Working with undergraduate and graduate students in the Department of Computer Science as well as MBA candidates from the McDonough School of Business is comparable to consulting. His research in enterprise integration is closely tied to real-world problems. And he knows he's preparing students to enter the working world.

Dr. Sencun Zhu

Sencun Zhu (PhD in Information Technology, 2004) came back to the classroom by a different route. An Assistant Professor in the Computer Science Department at Penn State University since 2004, his primary focus is research in security and other topics – teaching hundreds of undergraduates and 15 graduate students comes with the territory.

For Dr. Zhu, the challenge of motivating students who may not be interested in the subject matter is repaid by seeing them truly understand what they are learning and preparing them to continue their studies.

Dr. Vijay Sugumaran

Vijay Sugumaran (PhD in Information Technology, 1993), the son of an educator in his native India, came to the United States as a graduate student. As a PhD candidate at Mason, many of his professors reinforced the appreciation for teaching that he had gained from his father. Sugumaran is a tenured pro-fessor of Management Information Systems in the School of Business Administration at Oakland University in Rochester, Michigan. He teaches both undergraduate and graduate students and says that he is challenged by helping students to find positions in a tough economy and helping them succeed in their careers and life.

Dr. Sugumaran advises his students: "Take responsibility for your own learning and be a lifelong learner." Dr. Blake echoes: "Understand what generally makes you happy and pursue it. Your career will follow suit." Some of their lucky students may find their own way back to the classroom to educate others.

▼ CS Faculty Awards

Professor Songqing Chen Receives Young Investigator Award

Songqing Chen, Assistant Professor, received a Young Investigator (YIP) Award from the Air Force Office of Scientific Research (AFOSR) in January 2009 for his proposal, "Self-detecting Stealthy Malware on your Host".

The proposal seeks to develop new techniques based on fundamental malware characteristics in order to efficiently deal with the malware variants and to minimize the impact on the normal applications running on a host simultaneously.

Prof. Chen is a member of the Systems Group in the Department and conducts research in the areas of Internet content delivery systems;

Internet measurement and modeling; operating systems and system security; and distributed systems and high performance computing.
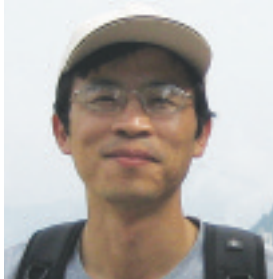
Dr. Songqing Chen

The Young Investigator Research Program is open to scientists and engineers at research institutions across the United States, who have received PhD or equivalent degrees in the last five years, and show exceptional ability and promise for conducting basic research. The objective of this program is to foster creative basic research in science and engineering, enhance early career development of outstanding young investigators, and increase opportunities for the young investigators to recognize the Air Force mission and the related challenges in science and engineering.

Prof. Chen is also a recipient of an NSF CAREER award.

Professor Xinyuan Frank Wang Receives Prestigious NSF CAREER Award

Professor Xinyuan (Frank) Wang, Assistant Professor received a $400,000 5-year CAREER award in February 2009 from the National Science Foundation for the project "Malware Immunization and Forensics Based on Another Sense of Self."

Our natural immune systems are very effective in protecting our body from intrusions by (almost endless) variations of pathogens. Our immunities depend on the ability to distinguish our own cells (i.e., *self*) from

Dr. Frank Wang

all others (i.e., *non-self*). Inspired by the self-nonself discrimination in the natural immune systems, this research explores a new direction in building artificial malware immunization and malware forensics capabilities based on *another sense of self*, which is essentially a unique mark to be assigned to the programs to be protected.

Based on such an actively assigned "another sense of self", the "immunized" program is able to detect application level malwares effectively and efficiently. In addition, the actively assigned "another sense of self" enables new malware forensics capabilities that were not possible before. Since the artificial malware immunization technique does not require any specific knowledge of the malwares, it has the potential to be effective against new and previously unknown malwares.

Professor Carlotta Domeniconi receives the 2008 Mason's Emerging Researcher, Scholar, Creator Award

Professor Carlotta Domeniconi, Associate Professor, is one of three recipients of the 2008 Mason Emerging Researcher, Scholar, Creator Award. The award comes with a cash prize of $3,000. Dr. Domeniconi's areas of expertise include: machine learning, data mining, pattern recognition, classification, clustering, feature relevance estimation, text mining, and bioinformatics. She is also a recipient of an NSF CAREER award. The CS Department extends its congratulations to Dr. Domeniconi for this prestigious award.

Dr. Kenneth Nidiffer

Please, Call Me Ken

The Computer Science Department's longest serving Adjunct Professor offers students a lifetime of experience.

Adjunct faculty members are an important part of our CS department team. Though they may only appear one day a week or one semester a year, their experiences, often directly from industry and government, round out our full-time faculty offerings.

Dr. Kenneth Nidiffer leverages his 45 years of government and industry experience in the classroom. Ken has been an active adjunct faculty member since 1989. He says, "After all these years I still learn from my students."

Over the course of his professional career, he has earned numerous awards, citations, and educational credentials. He's a published author, respected researcher, practicing software systems engineer, retired Air Force Colonel, and corporate executive who has earned BS, MS, MBA , and D.Sc degrees. Any student fortunate enough to take his Software Project Management class - taught in the MS in Software Engineering program - will tell you that he knows what he's talking about.

Ken says that even though teaching takes a great deal of time, he'll never give it up. "I am making a

Faculty Spotlight, *from page 7*

difference in improving society! I have a wonderful niche at Mason and I respect the people I work with."

Ken brings an interesting historical perspective to how the department has changed over his 20 years here. His involvement with the

> "Project management doesn't have any boundaries, and computer science and software development is an imaginative and creative world."

school began when the then School of Information Technology and Engineering was exploring the idea of a Software Engineering program. That idea blossomed into a full-scale degree program with several certificate offerings. The MS in Software Engineering was housed in the Department of Information and Software Engineering (ISE). The CS and ISE departments merged in January 2008 to become the new CS Department.

Ken sees these changes as positive and a reflection of how the Volgenau School has grown and earned a well-deserved reputation. He says that he has certainly seen the caliber of students change for the better. "There are significantly more international students studying here today than in the past. We see these students take the lessons they've learned and apply them back to their home countries."

Dr. Nidiffer still finds his subject interesting and increasingly more important. He explains that there is a constant need to create bigger and more integrated systems, and the larger a new program becomes, the greater the need for new and creative project management strategies. The constant change and growth in his field keeps him interested: "Project management doesn't have any boundaries, and computer science and software development is an imaginative and creative world."

Ken's style of teaching comes from his belief that true education is about facilitating the student's efforts to learn. He says, "I tend to ask a lot of questions during class to get everyone thinking about solutions." And learn they do. Ken has taught close to 1000 students at Mason alone. He gives them his experience, his attention, and his passion for the subject. And when asked what he likes to be called — professor, doctor, or colonel — he says simply, "I like it when they feel comfortable enough to call me Ken."

▼ Chair's Message

Welcome to spring at Mason. We have just completed our move to the new Engineering Building, which is a striking ecological building, and the second largest building on campus after the Johnson Center. You can come and see it on your next visit to campus – it is opposite the aquatic building. The Grand Opening Ceremonies for the new building will be on October 2. So much attention has been spent on the building that we felt it important to devote this issue of the Computing News to what's inside CS, our new programs and world-renowned faculty.

Mason is bucking a trend, and we're proud of it. Worldwide the number of CS students is falling and the numbers for women in CS are even lower. Our department has eight female faculty members. These amazing professors set a strong example to women entering the field of CS, as Ken Nidiffer, our longest serving adjunct adjunct professor tells us, is an incredibly creative profession. CS can and does appeal to students who want to explore a variety of professions. You will read more about the women in the CS department, Ken Nidiffer, and our creative new computer game design concentration in this issue.

We would also like extend our congratulation to several of our faculty members. Professor Songqing Chen received the prestigious Young Investigator award from the Air Force for a 3-year $300K project titled "Self-Detecting Stealthy Malware on Your Host." Professor Xinyuan (Frank) Wang received in February 2009 a $400,000 5–year CAREER award from the National Science Foundation for the project "Malware Immunization and Forensics Based on Another Sense of Self." The US PTO issued on February 17, 2009 the patent 7,492,943 B2, title: "Open set recognition using transduction", to Prof. Harry Wechsler and his student Fayin Li. Professor Ken De Jong was named by Mason's Board of Visitors to the special rank of University Professor. Professor Carlotta Domeniconi is one of the three recipients of the 2008 Mason Emerging Researcher, Scholar, Creator Award.

Visit us online http://cs.gmu.edu for more information on faculty and programs.

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