THE LINK

> issue 2.0
spring 2007

news from the school of computer science
at carnegie mellon university

< plus >

< Sharon Burks >

< Computational Biology >

< 25th Anniversary of the “Smiley” >

Calendar of Events

All events to be held at the Carnegie Mellon University campus in Pittsburgh unless otherwise noted.

April 11
An Evening with the University Provost: Global Vision, Innovative Edge
> *Broadway on the Square, New York*

April 12
National Academy of Engineering Regional Meeting and Public Symposium
"Technology for Life and Living: TELL Me More"
Featuring national and regional experts in medicine, technology and public policy who will highlight technologies being developed to enable and enhance independent living for older adults.

April 19-21
Spring Carnival

SCS Alumni Reception
Friday, 4 to 6 p.m.

April 30
The New Software Industry
One-day conference
> *Carnegie Mellon West*

May 9
"Meeting of the Minds" Undergraduate Research Symposium

May 19
Doctor's Candidates Hooding Ceremony

May 20
SCS Breakfast

Commencement

SCS Diploma Ceremony
> *Carnegie Music Hall, Carnegie Museum*

May 23
The Business of Entertainment
An alumni reception and panel discussion on the business side of entertainment. Sponsored by the Entertainment Technology Center.
> *Time-Life Building, New York*

June 25
Andrew's Leap begins
An intensive, six-week computer science summer enrichment program for high school seniors.

July 9-13
Java Workshop for APCS Teachers

July 13-16
CS4All: Explorations in Computer Science

July 16-20
Alice Summer Institute

July 21
Annual SCS & ECE Alumni Picnic
> *Mountain View, California*

Picnics will also be held in Seattle and San Francisco
Dates and locations TBD

August 27
Fall semester begins

October 5-7
OurCS: Opportunities for Undergraduate Research in Computer Science
A new conference sponsored in part by Women@SCS. For more information, visit www.cs.cmu.edu/ourcs.

October 25-28
Homecoming

Visit www.alumni.cmu.edu and click on Upcoming Events for details.

Correction: *In the Student Award section of Issue 1.1, Ariadna Font-Llitjos (CS'01) was incorrectly identified as a Fulbright Scholar. She received the Google Anita Borg Memorial Scholarship for the 2005-2006 academic year.*

THE LINK

news from the school of computer science at carnegie mellon university

The Link provides a mosaic of the School of Computer Science: presenting issues, analyzing problems, offering occasional answers, giving exposure to faculty, students, researchers, staff and interdisciplinary partners. The Link strives to encourage better understanding of, and involvement in, the computer science community.

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Inquiries concerning application of these statements should be directed to the Provost or the Vice President for Enrollment, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2000.

Carnegie Mellon University publishes an annual campus security report describing the university's security, alcohol and drug, and sexual assault policies and containing statistics about the number and type of crimes committed on the campus during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The security report is available through the World Wide Web at www.cmu.edu/police/statistics.htm.

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Contents

From the Dean

Welcome to the third edition of The Link,

our report on the activities of the broad community that makes up the School of Computer Science (SCS) at Carnegie Mellon University.

Our cover story describes CS4All, a program we initiated to help high school computer science teachers present computer science as a rich discipline with deep intellectual roots and interesting applications. Those of us working in the field know how exciting it can be and our graduates continue to find ample and rewarding opportunities. Unfortunately, the image of IT careers portrayed in the media has become one of diminishing and unappealing jobs. Nationwide, the number of students majoring in computer science has dropped precipitously. According to the Higher Education Research Institute, in 2006 only 1.1 percent of incoming freshmen at U.S. universities indicated their intention to enroll in computer science, down from a peak of 3.7 percent in 2000. Despite the significant drop in undergraduate applications, from a peak of 3,237 in 2001 to a low of 1,732 in 2005, our program at Carnegie Mellon has been able to stay strong. We have always been able to find 140 highly qualified freshmen to enter our program. The application numbers for 2007 are encouraging: over 2,300 to date. We at SCS believe it is important for our institution and for our society to make sure that computer science continues to attract the best and brightest students. As SCS alumni and friends, there are opportunities for you to become involved in the CS4All initiative as well. Please see page 13 for ideas and contact information.

In another article, you'll learn about Carnegie Mellon's growing efforts in the area of computational biology. Faculty from four of the six SCS institutes and departments are involved, bringing a variety of perspectives and approaches to bear on the problems and collaborating with researchers across campus. We have also developed a strong partnership with the University of Pittsburgh, including operating a joint Ph.D. program.

We hope you find this publication interesting and informative. We welcome your feedback; please contact us at thelink@cs.cmu.edu with your comments and suggestions.

Randy Bryant

> **Randal E. Bryant,** dean

More than 20,000 cubic yards of clay, shale, limestone and good old fashioned dirt have been scooped out to make way for the new SCS Complex, and there's still at least that much left to go. It's one of the most ambitious construction projects Carnegie Mellon has ever undertaken: two LEED-certified green structures with a combined total of 210,000 square feet, a 150-space underground parking garage and some 120,000 square feet of green space—all on a compact site that slopes nearly 10 percent.

And, while it might not look like much right now, in a couple of years, this will be one of the nicest places on campus in the springtime. There will be Hazel trees flowering in the winter garden area planned for in-between the two buildings and a colorful ground cover called Sedum spurium, or stonecrop, will be budding on the green roofs near the upper story patios. Down below, at one of the lowest points of the entire site, a small rain garden of scouring rush grasses, Marsh marigolds and other wetland plants will naturally filter the spring rain runoff.

Currently, steel columns and wood lagging are being installed behind the Purnell Center for the Arts to hold the steep hillside in place. Concrete work for the foundations, the retaining walls and the parking garage is on the schedule for this coming summer.

Visitors can view the progress virtually by pointing their browsers to gatescenter.blog.cs.cmu.edu and clicking on the Webcam link.

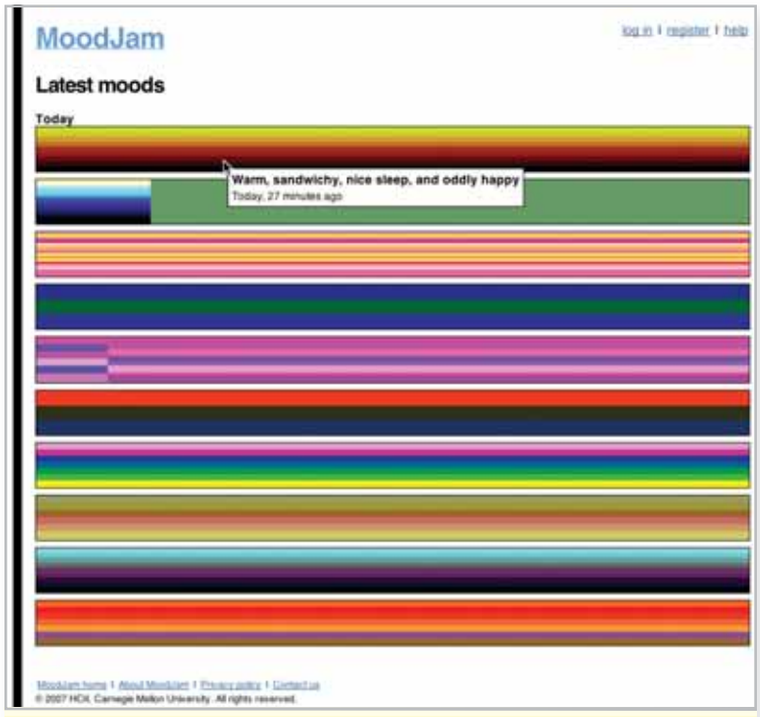
On Campus

Color Me Happy

Using approaches from ubiquitous computing, interface design and behavioral research, doctoral student Ian Li is exploring how technology might help people make better decisions, particularly through increased self-awareness. His IMPACT project (Increasing and Motivating Physical Activity through Context) aims to provide motivational feedback to users by automatically tracking their daily actions in context and then correlating those actions to physical fitness. He is also working on similar tools for office productivity.

Last November, Li and his colleagues developed and launched MoodJam, a Web-based application for tracking the emotions of individuals within a working group through the use of colors and descriptive tags. With a palette of 216 colors to choose from and no predetermined color combinations or words to convey specific moods, each user's input is unique, personal and visually appealing. Postings are displayed on the MoodJam.org Web site or there is a "gadget" version that can be installed on an individual's homepage. The intriguing software quickly spread to larger work groups, among circles of friends across campus and even to far-away family members.

MoodJam is a good fit for Li's research: improving self-awareness through consistently tracking your emotions. Surprisingly, however, many users also report being motivated to update their logs by the broader social benefits of sharing their emotions, such as getting an instant message from a friend based on a MoodJam display or a parent being able to "virtually" check on their son or daughter with the click of a mouse. Professor Anind Dey, one of Li's faculty advisors, said the software is "extremely exploratory" but poses interesting questions about how mood-sharing affects the dynamics of work groups and how moods converge and diverge within various social groups.



MoodJam, created by Ph.D. students Ian Li, Scott Davidoff (CS'04) and Karen Tang, along with SCS Research Associate Aubrey Shick (A'06), recently won two "Google Gadget" awards.

Congratulations to the 2006 Staff Recognition Award winners!

Outstanding Support Staff:
Catharine Fichtner (A'95)
Rebecca Klaas

Team Effort Award:
SCS Facilities Group

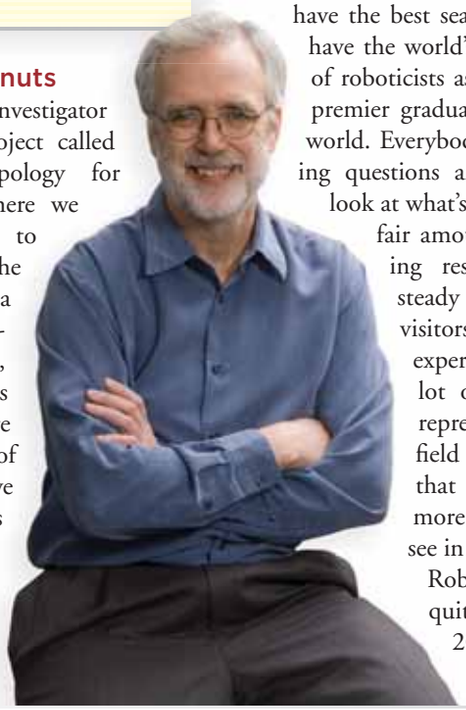
Technical Staff Support Award:
Jim Tobin

Individual Dedication:
Rachel Burcin (HNZ'07)
Sharon Cavlovich
Catherine Copetas
Alan Guisewite
AnnMarie Zanger

Matt Mason

Professor of Computer Science and Robotics

Director, Robotics Institute



Coffee and Doughnuts

I'm co-principal investigator on a new DARPA project called STOMP (Sensor Topology for Minimal Planning) where we are relating robotics to algebraic topology—the mathematics that tell us a coffee mug and a doughnut are, in some ways, the same thing. It relates to how many holes there are in a certain kind of space. In robotics, we worry a lot about spaces and what shapes those spaces have and when you do motion planning or control, you're trying to define structure on those spaces. Topology can sometimes tell us what is possible and what is not possible.

Robotics in Life

As director of the Robotics Institute, I have the best seat in the house. We have the world's greatest collection of roboticists as well as one of the premier graduate programs in the world. Everybody tolerates me asking questions and getting a good look at what's going on! I spend a fair amount of time matching researchers with the steady stream of outside visitors requesting our expertise. I also have a lot of opportunities to represent robotics as a field and teach people that robotics is much more than just what you see in science fiction.

Robotics has changed quite a bit over the past 20 years. It used to be entirely about robots taking care of tasks where you wouldn't want a human being—tasks that are dirty, dull or dangerous. We now realize that some of the most exciting things that robots can do is to work *with* people.

Another exciting thing happening is the new Robot City development on the former LTV site in Hazelwood. There are many acres on which we can do experiments on brownfield remediation, on surveillance, on all manner of field robotics. We're working to attract commercial partners and the entire project will have an impact on the surrounding economic community, too.

Learning Firsthand

Nobody knows more about manipulation than human beings and you can learn a lot from firsthand experience. When one of my graduate students was investigating robotic juggling, I learned to juggle. Same with the origami robot—everybody in the lab did some folding. We do things every day that robots would only dream about—if they could dream, that is.

William Scherlis

Professor, School of Computer Science

Director, Institute for Software Research (ISR)

Director, Ph.D. Program in Software Engineering

Institute for Software Research (ISR)

The magic of ISR is that it's not just about software or software engineering. It's about applying computer science to the development of systems and about how those systems connect with society, everything from mobile computing and supply chains to privacy and social networks and more. In order to create meaningful progress in any of these areas, we need to have deep, technical computer science knowledge and we also need to understand the effect of cost and schedule constraints, markets and economics, the policy and regulatory environment and the reality of human teams operating in large collaborative projects.

Scaling Down to Scale Up

For many years, most research techniques for software assurance have focused on achieving a comprehensive verification that the system does what it is supposed to do—basically proving a very big theorem about what is almost always a rather small program.

In our Fluid Project, we wanted to turn that idea around by reasoning about more particular attributes of programs, attributes that relate to dependability and security and that tend to defy traditional testing and inspection. Using a combination of program analysis techniques supported by simple design intent, we took on the challenges of scale and adoptability. Our ultimate test was with major vendors, where we successfully analyzed complex multi-threaded production code for issues such as race conditions. The result: for an interesting set of attributes, we were able to prove small but very useful theorems about large production programs.

Building Blocks

As computer scientists, we are involved with software all the time. It's worthwhile, however, to recognize how pervasive software really is, how it shows up in systems in practically every sector in some pivotal role. I think it's because software is uniquely scalable and uniquely flexible—and these are limited only by our intellectual and creative power.

Faculty Awards

Throughout 2006, many SCS faculty were recognized for their outstanding contributions to computer science.

American College of Medical Informatics Fellow
Latanya Sweeney

Association of Computing Machinery CHI Academy
Scott Hudson

Association of Computing Machinery Members-at-Large
Bruce Maggs
Jeannette Wing

Association of Computing Machinery SIGMOBILE Outstanding Contribution Award
Daniel Siewiorek
For pioneering and fundamental contributions to wearable and context-aware computing.

IBM Faculty Award for Innovation
Christos Faloutsos
Carlos Guestrin

IBM Unstructured Information Management Architecture Innovation Award
Eric Nyberg (HS'92)

IEEE Fellows
Michael Erdmann
For contributions to robotic manipulation and perception of shape.

Katia Sycara
For contributions to case-based reasoning, multi-agent systems and semantic web services and standards.

IEEE Longuet-Higgens Prize
Takeo Kanade (with Henry Rowley, Shumeet Baluja)
Awarded for a contribution that has stood the test of time: Neural Networked-based Face Detection.

John D. and Catherine T. MacArthur Foundation MacArthur Fellow
Luis von Ahn (CS'03, '05)

National Academy of Engineering
Manuel Blum
For contributions to abstract complexity theory, cryptographic protocols and the theory and applications of program checkers.

Pradeep Khosla (E'84, '86)
For his contributions to the design and sensor-based control in robotics systems for the assembly of precision electronics, and for innovative leadership in engineering education.

National Science Board Vannevar Bush Award
Raj Reddy (jointly with Charles Townes)
For his lifetime contributions to science and for his long-standing statesmanship in science on behalf of the nation.

NSF CAREER Award
Jonathan Aldrich (E'84, '86)
David Andersen
Alexei Efros
Eric Xing

Royal Netherlands Academy of Arts and Sciences Dr. A.H. Heineken Prize for Cognitive Science
John Anderson (E'61)
For his ground-breaking theory of human cognition.

Alfred P. Sloan Foundation Sloan Fellows
Carlos Guestrin
Doug James
Adrian Perrig (CS'99, '02)

Popular Science Brilliant 10
Luis von Ahn (CS'03, '05)

Her first day at work was May 6, 1977: Black Friday.

Her new boss, Computer Science Department (CSD) Head Joe Traub, invited her to listen in as the entire faculty of 15 gathered around a table to talk about the 62 students pursuing doctoral degrees, including the few that would be asked to leave. It was an intense introduction. She left the meeting after three hours, glassy-eyed and glad she and Traub had agreed on a three-week trial period.

Seven department heads, four deans, 767 graduate students and 30 years later, Sharon Burks, CSD assistant head and SCS associate dean, will retire from Carnegie Mellon and leave behind a legacy of compassion and unparalleled expertise. "I can't imagine finding any place that would have been so perfect for me," says Sharon. "It allowed me the flexibility to do things with my children that I needed to do and yet it gave me lots of challenges."

Search the SCS Web site for "Sharon Burks" and you get a sense of how vital this soft-spoken Georgia native is to the entire SCS organization. Her home page is *the* source for administrative topics such as the upcoming Black Friday schedule, tips for hosting a visiting faculty candidate and everything an incoming graduate student needs to know. She is the point of contact for all SCS faculty hiring—from placing the initial advertisements to finding office space when they arrive on campus. Her name and contact information appear on everything from the CSD faculty list to the Ph.D. thesis checklist to campus-wide information pages on class enrollments and the new SCS Complex. More telling, however, is the high percentage of search hits that point to the acknowledgment pages of so many CSD doctoral theses, each thanking Sharon for her guidance, her genuine concern and her ability to answer "all questions when no one else could."

The Early Years

During her first decade at Carnegie Mellon, graduate students were in and out of her office all of the time, picking up reading packets, dropping off qualifiers, wandering through the connecting door from the CSD office to ask a question or just say hello. "When there was a TG, which was held in a little bitty lounge down the hall, there were groups that came and hung out in my office," she remembers with a smile. The students became "her kids" and she their "den mother."

Sharon is still the official keeper of the Qualifier Football, a relic from those first heady years. "I would bring the questions in and the students would be there throwing this football around. They said it had to

touch every student's hand," she says with her signature laugh, "or that person would be cursed."

In 1988 CSD transformed and grew into the School of Computer Science. Sharon gained the new title of assistant dean while retaining her responsibilities within CSD. The program kept growing and changing throughout the early 1990s: her original 62 kids swelled to a high of 210, several departments were added to SCS and many of the graduate students began working in groups with their own support staff. Sharon saw a sharp change in the students who passed through her door. She remained the "go to" person for first year Ph.D. students, but, sadly, saw less and less of the older ones. "I miss that part," she says. She "would have been perfectly happy" to stay focused on helping students, but her responsibilities continued to grow in tandem with the department, the school and the university as a whole.

Sharon with her husband, Alton.

Passing Through

With her customary modesty, Sharon claims that "all the interesting things in my life have been the people who have come through it." The shelves in her office are sprinkled with reminders of some of them: colorful Chinese paper fans, an aboriginal drawing from Australia, a Mr. Potato Head toy left behind one year, a rock that looks quite like a brain. "My son found it and said I should put it in my office so I would be smart," she recalls. "It's been there the whole 30 years." On the door is a collage of her "grandkids"—the children of her SCS "kids."

Many of the students who have passed through her life have a story about Sharon, too. One in particular epitomizes Sharon's innate compassion for others and her dedication to getting the job done. In the early 1990s, as the Soviet Union began to collapse, the department received a Ph.D. application from a young man in St. Petersburg. As per usual, his acceptance letter was sent via express mail; yet he never responded. Many administrators might have simply marked the application as 'no response' and filed it away. But not Sharon. She found a religious agency in New York City who could get the information behind the Iron Curtain through a chain of international faxes. Once the young man knew he was accepted, he left his job as a research scientist with a high-level security clearance and went to work as a car salesman—a career not known for controversy and much less likely to raise concerns at the U.S. border. When he arrived on campus, Sharon bundled him, his one suitcase and his bike into her car and got him settled in at a local hotel for

At an alumni reception in New England this past fall, from the left: SCS Alumni Director Tina Carr (HNZ'02), Dean Rubine (CS'91), Chris Maeda (CS'92, '97), Sharon Burks, Bryan Loyall (CS'92, '97) and Rajith deSilva (CS'94).

some well-earned rest. Throughout his years on campus, Yuri Smirnov (CS'97) would often stop Sharon in the hallway and thank her again for changing his life.

Looking Forward

Sharon's office is still near the graduate student lounge in Wean Hall and her door is still open most of the time, but TGs are now held a couple of hallways over in the wide open space of the Perlis Atrium and most of the graduate students have been redirected into the capable hands of others. This time next year, Sharon and her husband may be on the road traveling—they have a long list of places they'd like to visit, everywhere from Spain to South Dakota. She'll do some volunteer work, of course, and might rekindle her interest in bowling.

Without a doubt, this time next year she will still be missed throughout SCS. For many years she has kept both the department and the school running smoothly with her thorough knowledge of the rules, regulations and policies. "She also serves as our institutional memory about all of the faculty and their hiring and promotions cases over the years," says SCS Dean Randy Bryant, "We'll probably be phoning her when she's 80 years old to ask about some past case."

More than that, Sharon will be missed for being Sharon. She may think that this was the perfect place for her, but she was also the perfect person for this place. "She knows how to balance ruling with an iron hand and ruling with a kind heart," says current CSD Head Jeannette Wing, "Her virtual presence will always be with us." Δ

Harry Q. Bovik created this one-of-a-kind Sharon pop art in 1998.

Sharon celebrates with the doctoral class of 1997.

Attendees and faculty of the
2006 CS4HS summer workshop.

Computer Science FOR ALL

Using pancakes and playing cards instead of programming syntax and keyboards, a new intensive weekend workshop introduces computer science with a unique "hands-off" approach.

SCS Professor Steven Rudich gets ready
to fix his "pancakes with a problem."

Dressed in a chef's hat and a blue-striped apron, spatula at the ready, SCS Professor Steven Rudich tells the tale of a sloppy pancake chef and the perfectionist waiter who wants to serve them up in a neatly ordered stack. Despite the soft laughter in the room and the smile on Rudich's face, this "Cooking for Computer Scientists" presentation is serious business—serious computer science business about nodes and networks and algorithmic boundaries. The audience? Forty-eight high school teachers from around the country, many still dressed in bright red aprons from the preceding lecture on fair and envy-free cake cutting. They're on campus to attend the new CS4HS: Explorations in Computer Science for High School Teachers weekend workshop. At the opening session the night before, workshop chair and SCS Lecturer Tom Cortina welcomed them in true Carnegie Mellon fashion by immediately giving them an assignment: perform a birthday radix sort on yourselves as a group, then find two commonalities with each of your neighbors. It was an ice-breaker for the teachers, but it was also a fun and powerfully simple demonstration of computer science in action.

This lighthearted approach has very serious intentions. Even as computing continues to rapidly expand as an important social and economic factor, high school curricula often lack the vital problem-solving skills of computational thinking. Programming in and of itself has become the de facto definition of computer science to the world at large. The programming language focus of the Advanced Placement (AP) course is a perfect example. "Programming is an important tool," says SCS Professor Lenore Blum, "but the underlying computational thinking is even more important. The idea of a program, of an algorithm, is very fundamental. The details of a programming language are very specialized and you don't necessarily get the big ideas behind the process."

Introducing this broader, conceptual view of computer science was the goal of the first iteration of CS4HS last summer. The pilot workshop received rave reviews and its innovative approach attracted partners from around the world. In 2007, the workshop will be improved and expanded to include targeted presentations across the United States.

No Computers? No Problem

During most of the intensive weekend participants didn't go anywhere near a computer. This unique "hands-off" approach was inspired by a simple, spiral-bound elementary school book from New Zealand titled "CS Unplugged."

"It's exactly the material we teach in our 15-251 computer science course, one of the hardest, deepest courses in our undergraduate curriculum," says Blum, who is also one of the CS4HS co-creators, "It's wonderful." The concepts are substantive, yet the presentations are fun and interactive. For example, a magic trick using plain, colored cards easily explains parity and error correction; students can experience a sorting network with a simple maze made of masking tape on the floor. Best of all, each demonstration can be easily scaled up or down depending on the age and experience of the audience.

Using "CS Unplugged" as a starting point, Blum and her colleagues at Carnegie Mellon packed the CS4HS weekend with elements from Cortina's new "Principles of Computation" class (15-105), the pancake presentation from Rudich's "Great Theoretical Ideas" class (15-251) and introductions to computational biology, cognitive tutors and robotics. Participants also engaged in panel discussions on careers, social responsibility and how to broaden participation in the discipline. Craig Neville-Manning, director of the Google New York engineering office, a native of New Zealand and the one who introduced Blum to the book, was on hand to present the "CS Unplugged" material and some of the creative Google widgets and software available online. The most popular session of the workshop was a last minute addition to the schedule: SCS Assistant Professor Luis von Ahn showed the teachers how a real-world problem such as labeling images for the visually impaired could be transformed with computational principles into a fun, interactive game.

Demonstrating computer science concepts without using a computer reveals the underlying problem-solving core of the discipline in a clear and concise manner. The CS4HS teachers came away with interactive examples and compelling materials that can

be used in a variety of settings to emphasize computational thinking throughout their curriculum. "The program changed the way I think about teaching computer science," says Elisa Heinricher, the computer science teacher for all 12 grades at the private Bancroft School in Worcester, Massachusetts. "It really made me think about the broad scope of CS and the future opportunities for my students."

Fellow workshop attendee Scot Tingle agrees that "many students are turned off by the idea of just writing code." As the computer science and business instructor at Snow Hill High School in Snow Hill, Maryland, Tingle thinks his students will be inspired when they are shown how computer science can be intertwined and embedded within other areas of study.

Making the Change

In the late 1990s, SCS increased the diversity and quality of its undergraduate student population by focusing on the important intellectual challenges of computing rather than the incoming students' previous programming experience. The summer workshop for high school teachers aims to use this same approach to augment the programming curriculum of the AP course and to build a groundswell of change in other disciplines. To better achieve these goals, the CS4HS program is increasing the number of events and changing its name to CS4All.

The CS4All program is a consortium of five innovative teams, each with unique strengths. Carnegie Mellon serves as the lead coordinator and will maintain its nationally-based teacher audience for the 2007 summer workshop. A separate state-specific workshop will be held at the University of Washington (UW) in Seattle and a district-specific workshop will be held at the University of California, Los Angeles (UCLA). Tim Bell, a computer scientist at the University of Canterbury in New Zealand and one of the authors of "CS Unplugged," is developing ready-made lesson plans and take-away materials for teachers at all three workshops.

All of this is being made possible by the fifth partner: Google. A generous $235,000 grant covers workshop administration and logistics. The grant also supports the minimal teacher registration fee (materials, on-site housing and meals are included; participants are responsible for their own travel and personal expenses). Additionally, the Google for Educators Web site will soon offer the CS Unplugged activities and the CS4All materials alongside many other exciting tools that teachers and students may use free of charge.

Most importantly, the CS4All program partners recognize that today's creative high school students can be tomorrow's passionate computer scientists and that all teachers, not just AP-CS teachers, play a central role in that transformation.

CS4HS attendees get a taste of fair and envy-free cake cutting.

High school teacher Scot Tingle meets one of the AIBO robodogs.

Below: Google's Craig Neville-Manning, far left, leads a group exercise in binary notation.

Speak Up, Speak Out and Make A Difference

As alumni of the Carnegie Mellon School of Computer Science, you are uniquely qualified to inspire the next generation of computer scientists.

1. Volunteer your experience, your opinions and/or your time at a CS4All workshop.

Nothing beats a living, breathing example of a computer scientist.

"For the workshops, we could certainly use statements or visits from alumni to relate their career experiences to the teachers. Email me!"

– Tom Cortina, SCS lecturer and CS4HS workshop chair

2. Share Your Passion

Contact your high school alma mater (or a high school in your area), speak with the career counselors, the science teachers, the business teachers and especially to the students. Tell them what you love about computer science. Be open to talking to students who are not typically attracted to computer science.

"The power of personalization, of saying 'when I was in high school, I didn't know this is what I'd be doing' is tremendous, especially for students who are getting mixed messages about outsourcing and writing code all day long."

– Judy Hallinen, Gelfand Center for Learning Outreach, Carnegie Mellon

3. Be an Advocate

Encourage your local school district and your state Department of Education to include computer science in curriculum standards. Encourage teachers to attend workshops like CS4All and to use proven learning tools such as Alice and the Robot Academy's Mindstorm curriculum.

"Industry and research labs are ultimately the product of K-12 education. Alumni need to think about where their talent is coming from, how are they going to grow their business and what they can be doing locally to support that work."

– Don Slater, SCS lecturer and Alice Institute co-leader

We can help you with ideas! Contact Tom Cortina or Lenore Blum for materials and assistance in defining how your experiences can benefit future computational thinkers. Δ

2007 Programs for Teachers

CS Unplugged May 1
For all teachers. An action-packed, two-hour show. Learn about the binary birthday bake, the parity memory trick and more; take away examples you can use in class immediately to illustrate the principles of computer science without using computers!

www.cs.cmu.edu/cs4hs/cs_show

Contact: Tom Cortina

AP Java Workshop July 7 - 13
For experienced Java teachers. Work with computer science instructors and explore topics from the Advanced Placement Computer Science AB curriculum through lecture, demonstrations and lab assignments.

www.intro.cs.cmu.edu/ap

Contact: Don Slater

CS4All
Pittsburgh July 13 -16
Seattle July 20-22
Los Angeles July 11-13

www.cs.cmu.edu/cs4hs

Contact: Tom Cortina

Alice Summer Institute July 16 - 22
For all teachers. Learn about Alice, an effective and engaging tool to introduce programming and computer science to middle students and beyond.

www.intro.cs.cmu.edu/alice-institute

Contact: Don Slater

NXT Robotics Training June 25 - 29
For middle school teachers. Leran how to use robotics to excite students about math, science and technology.

www.education.rec.ri.cmu.edu

Contact: Robin Shoop

ROBOTC Robotics Training
August 6 - 10
Learn how to program LEGO Mindstorm and VEX robots in a new cross-platform C-based programming language.

www.education.rec.ri.cmu.edu

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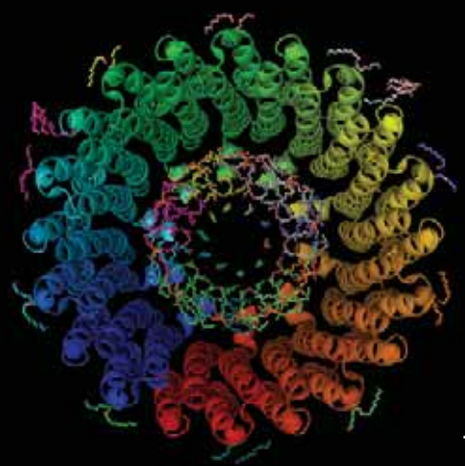
A COMPUTATIONALLY RICH WORLD



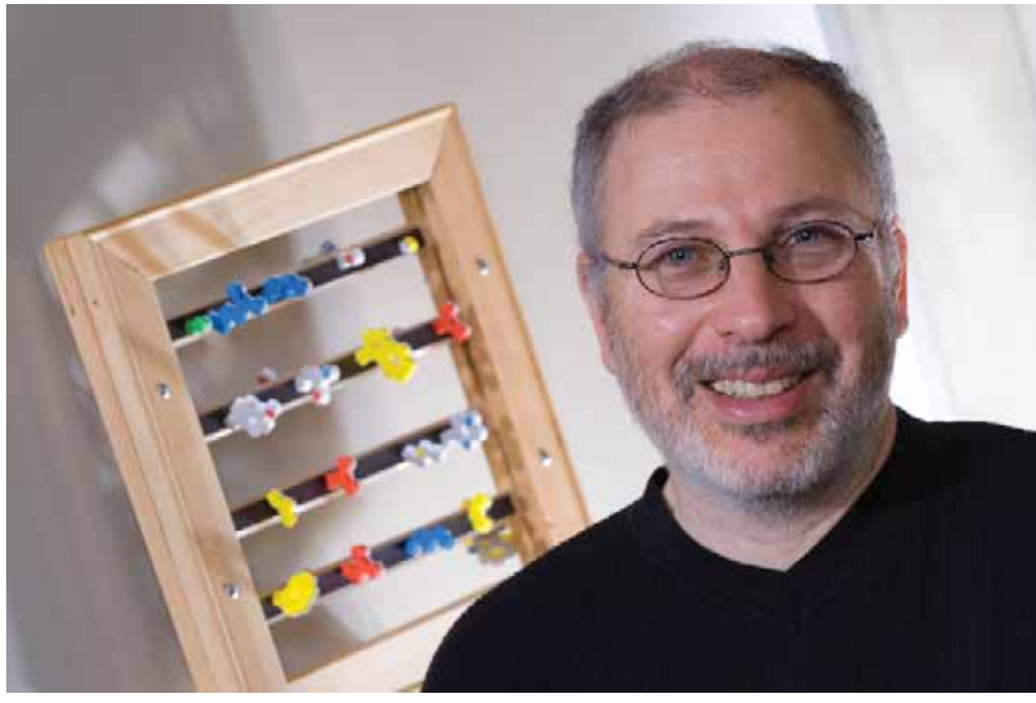
computer science comes of age in the natural sciences

Looking much like a child's Spirograph drawing, this unique pattern is a molecular visualization of a K-ring protein. The long ribbon, a simple chain of amino acids strung together, loops and swirls and folds back upon itself, creating a beautiful and intricate three-dimensional design. The order, or sequence, of the amino acids dictates the protein's shape and the shape determines its function, in this case to help pump sodium ions out of a cell. How

the sequence, shape and function are interwoven is one of the biggest challenges in modern molecular biology. Thanks to improved technology and decreasing costs, researchers can easily generate the protein sequence data. This capability, however, also creates substantially more information than can be effectively correlated with what is known about the folded shapes and functions. Similar bottlenecks are being seen in physics, engineering, chemistry and other natural sciences.

Many of these disciplines are now turning to computer scientists to decipher their expanding sets of raw data. In biology, traditional "wet" laboratories with Petri dishes, pipettes and microscopes are now complemented with "virtual" labs of complex algorithms and novel applications of the traditional tools of computer science. Everything from statistical modeling, machine learning and graph algorithms to email protocol, computer vision and knot theory are being engaged to decipher the nuances of biological phenomena.

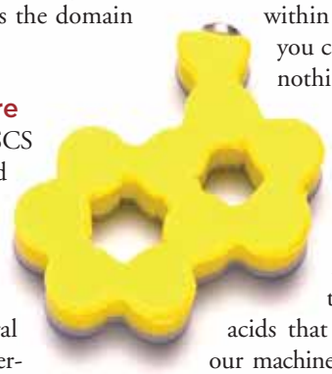
Nuances like protein folding. All protein chains fold up, but their final states vary widely. Some create beautiful round shapes, like the K-ring protein. Some have a distinct horizontal aspect. There are ones with long strands of ringlet curls and others with wide flat sections. And then there are the proteins whose seemingly random folds most resemble a plate of spaghetti thrown against the wall. Finding out why, how and what happens next in this very rich computational environment is the domain of computational biology.



To help visualize protein structures, SCS Professor Roni Rosenfeld pairs ready-made magnetic amino acid forms with a custom genetic code model created by postdoctoral fellow Andy Walsh and LTI graduate student Steve Gardiner.

A Word Here And There

In the fall of 2001, SCS Professor Roni Rosenfeld (CS'91, '94) was researching statistical language modeling when he was encouraged to join a semester-long Faculty-to-Faculty Seminar on general biology. He'd always been interested in how the brain functions, but he hadn't thought much about cell structures and DNA since high school. The seminar, designed to stimulate interdisciplinary work among the Carnegie Mellon faculty, hit the mark with Rosenfeld. "My jaw just dropped," he says, "I was amazed how much things had changed, how much was now known, how much could be understood computationally." Cells, it turns out, function very much like computers: they work in parallel, at varying rates on different processes and they are surprisingly digital in nature. "Change just one critical amino acid, one 'bit' in billions of bits of DNA, and the person carrying it may die within a month, while other bits you can change all you want and nothing happens."



Computational biolinguistics is how Rosenfeld is trying to figure out which bits are which.

The human body is a highly complex system, yet there are only 20 amino acids that make up essentially all of our machinery. Since there are only 20, it's easy to represent each one with a unique letter: A for alanine, S for serine, W for tryptophan and so on. The amino acids are arranged in long strings of unique sequences to form each of the more than 80,000 different human proteins. The sequence of each protein then induces a second level of complexity by causing the protein to fold up into a very specialized three-dimensional piece of molecular machinery.

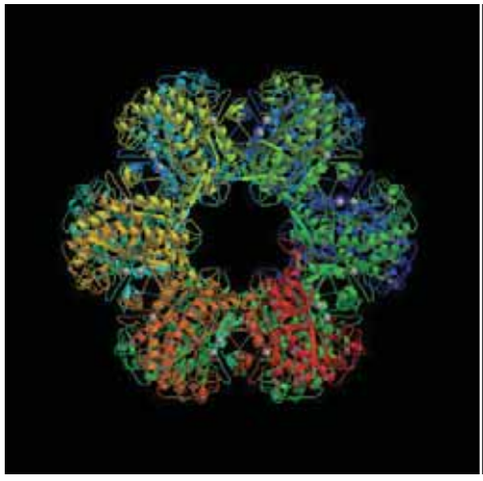
The analogy to natural language is easy to understand: a finite set of symbols (an alphabet) is used to create meaningful sequences (words) which are then strung together in a certain order (sentences) to provide a deeper, more detailed meaning than the individual words could convey on their own.

In both biology and language processing, it is relatively simple to collect the surface data—the sequence or the words—but extracting the correct meanings and predicting future results requires significant time along with a highly trained researcher or linguist who knows the discipline or the language thoroughly. Rosenfeld and his fellow researchers are working towards predicting the folded structure of a protein and its specific function based only on its linear arrangement of amino acids. "We are hoping that some of the models and techniques we have developed in the past decade for language modeling will prove useful in the biological domain," he says.

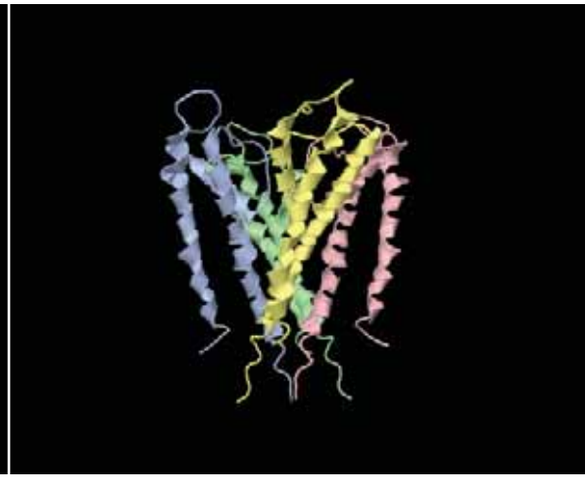
Another aspect of language-to-biology research is slightly more controversial: can

Previous page: K-ring protein image courtesy of Zheng Yang, University of Pittsburgh.

DNA be classified as a true language? A recognized language has a finite grammar and rules that govern which sequences are allowed and which are not; it's what makes a language able to convey different meanings using the same words. For example, in English there is a vast difference between "man bites dog" and "dog bites man." A branch of natural language processing, known as formal language theory, correlates the type of grammar specifications with the type of possible languages. According to Rosenfeld, proteins have a hierarchy and structure. "They are not just blobs," he explains, "they consist of domains that perform their jobs together." If formal language theory can be accurately applied to biological sequences, it could lead to useful discoveries in predicting molecular functionality.



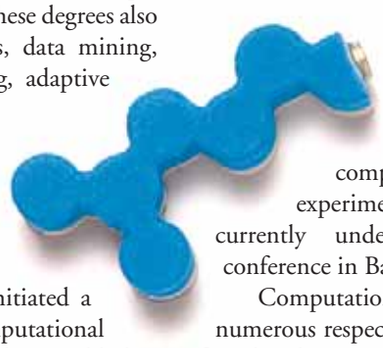
Glutamate sythetase: converts glutamic acid and ammonia into glutamine, which helps metabolize nitrogen.



Potassium transporter: involved in the directed movement of potassium ions into, out of, within or between cells.

Working Together

Rosenfeld isn't alone in his foray into biology; the Carnegie Mellon academic tradition encourages faculty collaboration across disciplines. SCS Assistant Professors Ziv Bar-Joseph, Christopher Langmead and Eric Xing are just a few of many SCS researchers involved in Carnegie Mellon's pioneering undergraduate and master's degrees in computational biology. In addition to standard biology instruction on genomes and how to fluoresce microscopic images, students pursuing these degrees also study advanced algorithms, data mining, statistical machine learning, adaptive computation and more.



Collaboration is also encouraged with researchers at peer institutions. In the fall of 2005, Carnegie Mellon and the University of Pittsburgh initiated a joint Ph.D. program in computational biology. By combining the world-class expertise of the SCS virtual labs with the extensive clinical research of Pitt's wet labs, this doctoral program is designed to develop research leaders who can integrate the strengths of computational, mathematical, and engineering tools with traditional experimental methodologies.

Another joint venture is the Carnegie Mellon-based Center for Biological Language Modeling (CBLM). Founded in 2002 with a large-scale grant from the National Science Foundation, the CBLM brings together researchers from five institutions (Carnegie Mellon, University of Pittsburgh, MIT, Boston University and the National Research Council of Canada) who are applying language technologies such as automatic speech recognition and translation, text document classification and search engines to formulate specific prediction tasks within the "protein sequence language." The center's annual Biological Language Conference presents cutting edge research in both computation and functional experimentation; planning is currently underway for the 2007 conference in Barcelona, Spain.

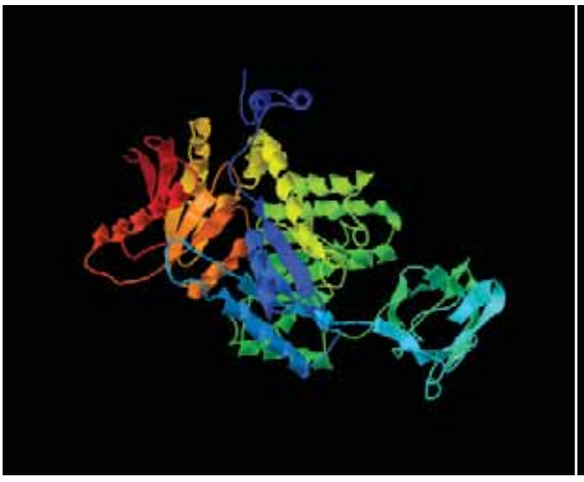
Computational biologists also have numerous respected publication channels for distributing their research findings. Among them are the *Journal of Computational Biology*, which began publishing peer-reviewed papers in 1995; the new Public Library of Science (PLoS) open-source computational biology journal produced in conjunction with the 10-year old International Society for Computational Biology; and the joint IEEE/ACM's *Transactions on Computational Biology and Bioinformatics* (TCBB) publication. Dannie Durand, a Carnegie Mellon associate professor in both computer science and biology, has served on the TCBB editorial board since its inception in 2004.

More Data = More Opportunities

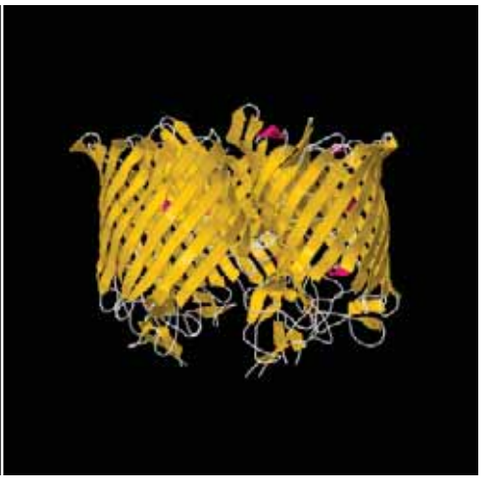
Three years ago, the Human Genome Project completed mapping the three billion chemical base-pairs that make up the more than 20,000 genes encoded in our DNA, a veritable blueprint of human life. Complete genomic data also exists for chimpanzees, dogs, mice, the fruit fly, the roundworm, 10 strains of yeast, more than 1,000 bacteria and many more organisms. This growing volume of data opens up another computationally rich area of biology: gene expression.

Gene expression is the process by which the DNA sequence of an individual gene—one of those 20,000+ recently mapped segments—is transcribed into an RNA sequence, which is in turn translated into a chain of amino acids to produce a functional protein.

The SCS Systems Biology Group, led by Bar-Joseph, has developed a computational model for large-scale integration of gene expression data from different experimental sources. The associated algorithm uses a set of known interacting



Pyruvate kinase: a key enzyme in the glycolysis pathway.



Maltoporin: responsible for the guided diffusion of maltose and maltodextrins into E. coli cells.

pairs to compute a temporal transformation between every two datasets and then searches for new interactions. This approach can overcome inconsistent experimental variables such as different sampling rates and a lack of repeats.

SCS doctoral student Jason Ernst (CS'05) is using greedy algorithms and hidden Markov models in his thesis work to improve the clustering and mapping of transcription factors—the protein switches that turn transcription on and off. His Short Time-series Expression Miner (STEM) identifies and compares gene expression information across multiple time points of a microarray experiment; thus far, STEM has been downloaded by more than 550 researchers around the world. Ernst also recently published a paper in Nature-EMBO's *Molecular Systems Biology* journal about his Dynamic Regulatory Events Miner (DREM), which focuses on identifying bifurcation events—the points in transcription where similarly expressed genes split into subsets. Knowing where and, more importantly, why bifurcation occurs may help researchers develop new drug targets in the future.

Computationally, there are many more opportunities in biology. Carnegie Mellon researchers are applying knot theory to analyze the folding process of proteins (Michael Erdmann), developing algorithms for studying genome variations between members of a species (Russell Schwartz), simulating the complexity of blood flow with scalable and parallel high-accuracy algorithms (Guy Blelloch and Gary Miller) and addressing network modeling in systems biology (Eric Xing). The list of specialties benefiting from the power of computer science continues to grow every year.

Brain imaging is one of SCS' newest ventures. Researchers are studying the computational principles of the brain by matching advanced machine learning algorithms with the incredible detail of functional magnetic resonance imaging (fMRI). At first, trained classifiers could only distinguish very broad differences in mental states, such as was the person reading a sentence or looking at a picture? Recently, however, SCS Professor Tom Mitchell and his colleagues at the Carnegie Mellon Center for Cognitive Brain Imaging report having trained their classifiers to distinguish whether a person is reading the specific words "hammer" or "hut." They are now collecting data on a wide variety of words and images in an attempt to discover the organizing principles of brain activity.

Expert Advice

Without doubt, computational methods are fundamentally changing the nature of biology and other physical science research. It is reminiscent of what happened twenty years ago in speech recognition: when researchers began applying hidden Markov models and other statistical processes to the explosion of newly available speech data, it spurred a revolution in contextual analysis and dramatically changed the field. Today, similar methods are being used to organize vast amounts of wet lab data, to identify the appropriate context and to make predictions to guide future research.

"What the School of Computer Science brings to the table is world-class expertise in so many computational areas," Rosenfeld says. "Once you settle on an important problem and identify the computational aspects of it, chances are we have the world expert in that particular area, be it machine learning, databases, algorithms, parsing, or what have you."

In addition to its unrivaled computational experts and a highly creative and intelligent student body, the School of Computer Science has a long tradition of learning-by-doing and tackling real-world problems. Like many of his fellow educators and researchers, Rosenfeld is motivated not only by the intellectual excitement of a project, but also by the desire to have a positive effect on important issues facing our society. For him it's the rapidly evolving sequences of viruses like HIV and influenza–sequences that are constantly changing and yet never seem to lose their power as a biological intruder. Find the part that it can't live without, he says, "and we can hit it where it can't run." Δ

Showing Our Emoticons:

The 25th Anniversary of the Original Smiley

> There is a lit candle in an elevator mounted on a bracket attached to the middle of one wall (say, 2" from the wall). A drop of mercury is on the floor. The cable snaps and the elevator falls. What happens to the candle and the mercury?

This quirky post on the Computer Science Department (CSD) electronic bulletin board (bboard), and the flame war that followed, inspired one of today's most widely used conventions in plain text communications.

> WARNING!
> Because of a recent physics experiment, the leftmost elevator has been contaminated with mercury. There is also some slight fire damage. Decontamination should be complete by 08:00 Friday.

> Re: WARNING!!
> The previous bboard message about mercury is related to the comment about Physics experiments. It is not an actual problem … My apology for spoiling the joke but people were upset and yelling fire in a crowded theatre is bad news.... so are jokes on day old comments.

It was 1982 and not the first time a joke had gone awry inside Carnegie Mellon's very young electronic community. Messages were often sent with the familiar air of a phone call or a chance meeting outside the computer room, but obviously lacking the customary visual or vocal cues of interpersonal communication. To eliminate future misunderstandings, several users proposed official "joke" markers: an asterisk, the ampersand, maybe the hash mark. The Gandalf VAX group offered its horizontal smile glyph. In a hastily written post on September 19, artificial intelligence researcher Scott Fahlman casually added another idea to the mix:

> I propose that [sic] the following character sequence for joke markers:
>
> :-)
>
> Read it sideways. Actually, it is probably more economical to mark things that are NOT jokes, given current trends. For this, use
>
> :-(

The convention caught on quickly within CSD. Soon the open-mouthed surprise smiley, the smiley with glasses and many other variations began showing up throughout Carnegie Mellon's nascent computer network. Led by emails like the one Visiting Professor Jim Morris (S'63) sent to his friend at PARC detailing this "communication breakthrough," the lighthearted glyph migrated out of Pittsburgh over the ARPAnet and into the realm of Internet legend.

Fahlman, now a research professor, AAAI fellow and head of the Scone knowledge-base engine research group at Carnegie Mellon, is amused by the smiley's success, "It's kind of weird being better known for a silly thing that I tossed off one day in five minutes than for the research I've done in the past 35 years or so. But it's also kind of fun." The smiley was such a spur-of-the-moment idea that no one, not even Fahlman, thought to keep a record of the bboard post. "By the time I realized that this smiley-face phenomenon was going to be long-lasting and that it would spread around the world as the Internet grew, it was too late to easily retrieve the post and the original message was lost for many years."

Today, the :-) smiley glyph and its hundreds of cousins are recognized worldwide. Known as emoticons, these symbols help us express emotions from love to rage to political satire to just plain silliness in the limited and often cryptic environment of text-based messaging. The Wikipedia entry for "emoticon" defines nearly 40 of the most common turn-your-head-to-the-side character strings, followed by numerous examples of the horizontal variety (the ones meant to be read without turning your head), the East Asian style and the Japanese Shift JIS glyphs. Many software programs now intercept the most widely used emoticons and change them into little pictures. If you happen upon one you don't quite understand, there are several emoticon dictionaries available online to help you decipher it.

(^_^)

East Asian

┐('～`)┌

Japanese Shift

When Mike Jones (S'82, '88, CS'92), director of connected systems customer strategy and evangelism at Microsoft, sees the sideways smiley in his messages, he often remembers reading Fahlman's original post. "I like history, including computing social history," he says, "and I knew that I was one of the few people in the world in possession of the knowledge that might be able to help us find the original post." As a graduate student at Carnegie Mellon, Jones had maintained the Bags software for the CSD bboards and he still knew where to locate the source code. So, in February of 2002, Jones wrote to Howard Wactlar, then-SCS facilities director, and the search was on.

Fahlman narrowed down the time frame they were looking for, Jones determined the file name it would most likely be found under and Wachtler and his staff located the back up tapes. Next, they had to locate a 9-track tape drive—a *working* 9-track tape drive—and a machine to use it on. Finally, using a compatibility mode in the restore program of a FreeBSD machine, and later a NetBSD machine, SCS research systems programmer Jeff Baird (S'80) painstakingly transferred and read through the monthly 4.1BSD dump format tapes.

On September 10, 2002, nearly twenty years to the day that Fahlman sent his message to the bboard, Baird hit pay dirt. "It was surprisingly more difficult to track down than you'd expect," he says. News of the discovery appeared in various newspapers and magazines—from the Seattle Times to Forbes magazine to Britain's Globe and Mail—and, of course, online at sites ranging from CNetNews and Slashdot to The Hindu, India's online national newspaper. On the actual anniversary, National Public Radio featured Fahlman and Baird in a telephone interview during "All Things Considered."

While finding the post is proof of the idea's inception at Carnegie Mellon, it's not proof that this was the very first use of the :-) character string to signify a smiling face. Given the limited character set in early teletype operations and the simplicity of the idea, it's likely as not that it was used in some fashion before 1982. However, Fahlman's elegant solution to indicate a humorous electronic message is generally seen as the birth of the modern emoticon. We at SCS are glad to now have this important piece of history close at hand. Δ

From the Director

Common Bonds

Spring brings not only better weather, but marks an important transition in the lives of many students as they prepare to leave Carnegie Mellon. This year, Sharon Burks, a highly respected SCS administrator, will retire after a 30-year tenure. The change of season, along with this impending retirement, made me reflect on the importance that faculty and peer relationships play in so many of our alumni's lives, both professionally and personally.

Students face many difficult issues during their time on campus. Friendships with other students can provide the support they need to navigate the ups and downs of campus life. Campus organizations also serve as a source of encouragement. For Phil Bronner (CS'92), the Carnegie Mellon Action Project (CMAP) played an important role. CMAP, says Bronner, "provided a way for me to interface with other minority students who were dealing with the same transitional issues that I faced. During your freshmen year, more than anything, you need someone to talk to, who listens and cares. The CMAP family provided that for me and I attribute a lot of the success I had at Carnegie Mellon to that organization."

Faculty relationships are another connection that students rely on both before and after graduation. Some faculty take on the role of mentors while others provide guidance on course selection, research options and career paths. Many times, research collaborations with faculty continue after students graduate.

Some faculty and staff play a greater role in students' lives by helping them navigate issues beyond those faced in the classroom. Many students come to regard these individuals as counselors, friends and even surrogate parents. They offer emotional support and demonstrate extraordinary concern for the students' well-being. For example, Mark Stehlik, assistant dean for undergraduate education, hosts a dinner at his home every year for those students who are not returning home for the holidays.

What means the most to the students is the faculty and staff's willingness to listen. They help students sort through their frustrations as well as celebrate their successes. "I still remember the day after I defended my Ph.D. thesis," says Shanghua Teng (CS'91), "Sharon came and gave me a big hug. 'You set a record of shortest time for a Ph.D. at Carnegie Mellon and no one might ever beat 11 months.' She knew a lot about us, because she really cared."

Occasionally, students find themselves needing help getting out of a sticky situation. Rune Jensen (CS'93) recalls traveling home to Denmark and how Sharon helped him renew an expired signature on his visa within a matter of hours.

It's easy to see how important peer and faculty relationships are during the students' years at Carnegie Mellon. It's these connections that not only provide the support students need to meet the demands of student life, but also contribute to their academic success while here. For many, these relationships will continue to strengthen and grow long after graduation.

I hope that you took the time to say thank you to all those faculty and staff who helped you along the way. You never know when they, too, may decide it's time to move on. But no matter where any of you are, you will always be part of the SCS family. So stay in touch! We all appreciate hearing from you.

Tina M. Carr

> **Tina M. Carr** (HNZ'02), director of alumni relations

< Stay Connected! >

Have you moved? Changed jobs? Have a new email address? Let us know!

Email your name, graduation year and your new information to Tina Carr, SCS director of alumni relations, at **tcarr@cs.cmu.edu** or visit the Carnegie Mellon alumni services Web site and submit your current contact information online.

LOG ON > www.cmu.edu/alumni

Come back to campus for

spring CARNIVAL

April 19-21, 2007

The thrill of Buggy...
the excitement of the Midway...
and the nostalgia of an SCS Friday night TG!

Who: You, as in SCS alumni and friends
What: The Alumni Reunion TG
When: Friday, April 20, 4-6 p.m.
Where: Perlis Atrium, Newell-Simon Hall
Why: Because we miss seeing your smiling faces

@ SCS Alumni Events

Carnegie Mellon Networking Nights were held this past January in Los Angeles, San Francisco, Silicon Valley and for the very first time in Seattle. While alumni from all seven schools mingled, local alumni chapter members were on hand to speak with future students and alumni employers could offer some informal recruiting. A Networking Night was held in Pittsburgh in February and then in mid-March, alumni in Chicago, Boston, New York and Washington, D.C. had a chance to attend a networking event in their home cities, too. Plans are underway to repeat all of these events next year. Hope to see you there!

SCS Dean Randy Bryant (left) shares a laugh with Ian Nieves (CS'01, '04) during Network Night Silicon Valley. Nieves took an innovative approach to recruiting by wearing his company's banner.

Left to right: Anoop Gupta (S'82, '86), corporate vice president of Microsoft, Judy Cole, associate vice president for university advancement, and Randy Bryant, SCS dean, were the featured speakers at the first-ever Network Night Seattle.

An unusual snowstorm blanketed the Northwest on the day of the Seattle event.

Alumni Snapshots

Mark Fox

B.Sc., Computer Science
University of Toronto, 1975

Ph.D., Computer Science
Carnegie Mellon University, 1983

A creative force with a wry sense of humor, Mark Fox excels at creating new business ventures and developing pioneering applications of artificial intelligence. In 1982, in the midst of his Ph.D. studies, he joined forces with three other Carnegie Mellon faculty to form the Carnegie Group, a leading knowledge-based systems applications company. As a consultant to Westinghouse Electric a few years later, he designed the first real-time sensor-based diagnosis system. Mark held an appointment as a Carnegie Mellon associate professor from 1987 to 1991 and served as the director of the Robotic Institute's Intelligent Systems Lab before that. Today, he spends "100 percent of my time" as chairman, CEO and co-founder of Novator Systems, which provides Web-based retail solutions for FTD and other e-retailers, and "the other 50 percent of my time" as a professor of industrial engineering at the University of Toronto. Somewhere in-between, he runs ChocolatePlanet.com, an e-retail outlet for premium Belgium sweets.

" The Carnegie Mellon environment—its people, culture and richness of ideas—provided me with the confidence necessary to pursue my goals. Interacting with research sponsors from both industry and government prepared me for dealing with clients. The energy, creativity and willingness to explore new ideas that pervaded the School of Computer Science gave me a rich foundation for my academic career as well."

Two of Mark's favorite memories of his time in Pittsburgh are his running route through Schenley Park and the many late nights spent at the "Dirty O" with friends and colleagues.

Mark and his wife, Tressa, a former associate director of the Robotics Institute, live in Toronto and have two adult sons. He is an AAAI fellow, was a AAAI councilor and is also a member of ACM, CSCSI, IEEE, IIE and SME.

Caroline Hayes

B.S., Mathematics
Carnegie Mellon University, 1983

M.S., Computer Science
Carnegie Mellon University, 1985

Ph.D., Robotics
Carnegie Mellon University, 1990

Caroline Hayes believes the key to solving the "big and important challenges" of the 21st century requires collaborating with researchers who have skill sets that are very different than her own. She first experienced the power and excitement of a cross-disciplinary environment during her graduate studies at Carnegie Mellon, where computer scientists, engineers and business people often worked side-by-side. Today, Caroline is a professor of mechanical engineering at the University of Minnesota and her Decision Support Systems Laboratory is a computer-intensive environment for building and testing intelligent tools to assist people in complex cognitive work. She uses artificial intelligence methods and cognitive modeling to create user-centered systems to support complex engineering tasks, such as manufacturing planning and design.

"You need to be looking ahead and thinking about what the future world will look like, or better yet, what it should look like. Computer science is entering a new phase of growth focusing on very complex socio-technical systems, including the use of computing technology to form global, virtual communities. Over the next decade, complex computing-technology systems will be used increasingly to manage everything from in-home care of the elderly, to ground transportation, factories and international airspace."

During her years on the Carnegie Mellon campus, Caroline enjoyed dining at Ali Baba's and the many other diverse restaurants of Oakland. Most of all, she fondly remembers the close-knit SCS community. Caroline, along with her husband and daughter, is currently a resident of the St. Paul, Minnesota community where her hobbies include travel, photography and "designing things and making them."

Ali Aydar

B.S., Computer Science
Carnegie Mellon University, 1997

Ali Aydar knew during his student days at Carnegie Mellon that he wanted to write servers and create network applications. In 1999, he joined Napster as the first non-founding employee and engineered a server software infrastructure capable of handling the company's explosive growth. He also led the development of Napster's next-generation authorized file sharing platform. Today, he is the chief operating officer for SNOCAP, an end-to-end provider of digital licensing for online music, where he directs the day-to-day business activities of engineering, government affairs, product innovation and many other groups.

" The broad technical knowledge that Carnegie Mellon provided has been instrumental in my career. Carnegie Mellon also taught me how to face a new challenge and how to break it down into simple components to overcome all of the issues."

Despite his technical expertise, Ali considers himself more of a "people person" who can straddle the line between business and technology. His favorite part of being a COO, in fact, is finding and capitalizing on new ways to uniquely position technology in the marketplace.

"Advances in computer science will continue to provide the catalyst for change across every industry and every discipline, including the music industry. I'm looking forward to the day when all music is available to anyone at anytime in any medium."

Ali likes to read and still plays basketball. His memories of campus include the spontaneity of the pick-up games at the University Center gym and getting together with friends for a meal at MadMex or Uncle Sam's in Oakland. He currently lives in San Francisco and, not surprisingly, enjoys a wide variety of music.

Latika Kirtane

B.S., Computer Science
Carnegie Mellon University, 2006

As a student, Latika Kirtane learned to balance a heavy academic workload with her duties as a resident advisor and a range of extracurricular activities, from Soundbytes to her sorority to Mayur. Today, she is putting her Carnegie Mellon education and experience to good use as a program manager for Microsoft. She works with designers, developers and testers across the company to achieve the vision for her team's product, which is part of the next generation developer platform for the Windows user interface. She is also involved in technical demonstrations and campus recruiting.

"Recruiting at Carnegie Mellon is a very rewarding experience because it is an opportunity to help fellow students succeed. A recruiter once saw something special in me at a time when I was very unsure of myself and gave me the boost I needed to realize my full potential. I like to think that I have in turn done this for others."

Before starting her job at Microsoft, Latika spent three months backpacking through New Zealand and Australia and traveled to both Jamaica and Russia with friends. She plays tennis, enjoys throwing pottery and spent this past winter learning how to snowboard. She plans to be back on campus for Spring Carnival in April.

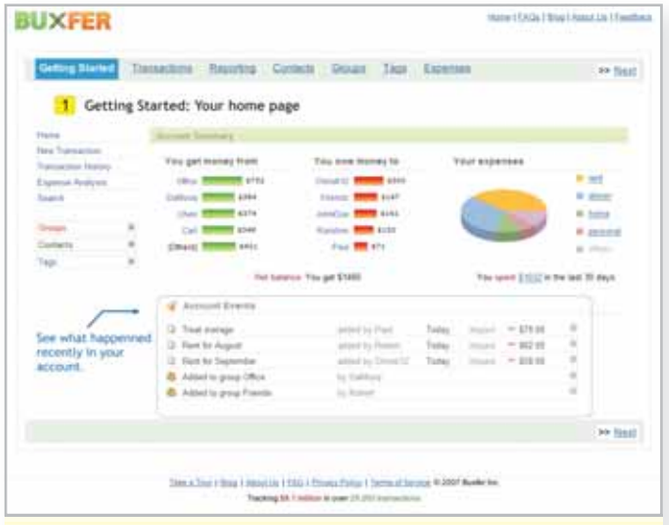
SCS in the News

Google Image Labeler

As is typical for the Web search giant, Google Inc. didn't have much to say in late summer when it began a soft release of Google Image Labeler. But bloggers immediately noted Image Labeler and recognized its resemblance to The ESP Game, a two-player Internet game first devised by Luis von Ahn (CS'03, '05), assistant professor of computer science, and licensed by Google. When von Ahn won a MacArthur Fellowship in September, the origins of Google Image Labeler, as well as the rest of his "games with a purpose," became common knowledge. The Washington Post, in particular, highlighted Image Labeler and The ESP Game in a November feature.

Buxfer

In the beginning, graduate computer science students Ashwin Bharambe, Amit Manjhi and Shashank Pandit simply wanted to write a bit of software to help them keep track of shared expenses – lunches, movie tickets and the like. But as more and more friends asked them for copies of the software, the trio realized that keeping track of who-owes-whom and who-paid-whom was a problem for many people. So they launched a Web site called Buxfer (an abbreviation of "Bucks Transfer"). Within a month or so, they had 1,500 users and several hundred thousand dollars in transactions. Those numbers jumped to 10,000 and more than $3.5 million after Buxfer was featured on the front page of the Sunday Pittsburgh Post-Gazette and after an Associated Press story was picked up by newspapers and Web sites around the world.



LOG ON > www.buxfer.com

NetProbe

eBay Inc. has been one of the Internet's great success stories, with 2006 revenues totalling $6 billion, up 31 percent from 2005. Not surprisingly this has made it a target of crooks. But Christos Faloutsos, professor of computer science, says data mining techniques could help eBay and other online auction sites track down these fraudsters. What's more, NetProbe, the tool he developed with research associate Polo Chau (CS'05), graduate student Shashank Pandit and undergraduate Samuel Wang can detect accomplices that enable fraudsters to build up deceptive reputation scores. Lee Gomes broke the story in his Wall Street Journal column and an Associated Press story was picked up by the Los Angeles Times, Washington Post and most other major newspapers.

Earth-shaking research

Early on the morning of Jan. 17, 1994, an earthquake shook the San Fernando Valley of California, killing 51 people and causing $44 billion in damage despite measuring just 6.7 on the Richter scale. Reverberations continue to this day in the form of computer simulations, as Carnegie Mellon's Quake Group looks to gain insight into why the "moderate" Northridge earthquake became the most costly tremblor in U.S. history. The group, led by David O'Hallaron, associate professor of computer science, and Jacobo Bielak, professor of civil and environmental engineering, most recently has used a coordinated, end-to-end approach called Hercules to simulate the quake using the Pittsburgh Supercomputing Center's "Big Ben" Cray XT3 and its 2,048 processors. The simulation team, led by Ph.D. student Tiankai Tu, won the Analytics Challenge Award at the Supercomputing 2006 meeting in Tampa, Florida, and was featured in the Pittsburgh Post-Gazette.

Bovik's Blog

AM I A MAD FOOL IF I SPEND MY LIFE IN GRAD SCHOOL
FOREVER SEARCHING FOR THE LONGEST PATH

27 FEBRUARY 2007

What do origami, gum boot dancing and bicycle repair have in common?

SCS, of course! Well, SCS Day to be more precise. If you've been away from campus for more than half a decade, you may not know about SCS Day. It's a "dynamic event" where everyone in the SCS community—undergraduates, graduate students, faculty, staff and even alumni—is invited to display their talents and share their skills in a fun and relaxed atmosphere. This year's event, held on February 24, revealed the truly amazing diversity and quality of talent that exists in our community.

First, there were the afternoon workshops where you could learn things like origami, gum boot dancing or ballroom dancing, bicycle repair, squash, chess and, of course, video game creation. (Gum boot dancing, in case you didn't know, originated in the gold mines of South Africa, became part of the urban working class culture and is now performed worldwide.)

You could also stroll through the art show and vote for your favorite artist. This year the honor went to post-doc Tibi Chelcea for his woodcuts. Other contenders for the title included photographers, painters, weavers, potters, calligraphers and more.

And then there was the talent show.

SCS Dean Randy Bryant and Associate Dean Klaus Sutner were dressed to the nines as co-emcees, and, again, the range of skills and creativity was impressive. There were violinists and guitarists and singers, karate and kung fu demonstrations and jugglers juggling with bowling pins and knives (oh, my!)

It takes a cadre of volunteers and coordinators to put it all together. From the emails and promotional materials to the logistics of which workshop goes in what room to securing sponsors, the SCS Day Organizing Committee put on its own display of skill and talent and creativity.

Bravo, one and all.

POSTED BY BOVIK AT 3:57 PM | 3 LINKS TO THIS POST

MY PROFILE

HARRY Q. BOVIK
PITTSBURGH, PA

Hi there, I'm Harry Bovik. For over three decades now people have been sending me opinions on all sorts of local topics. I'm grateful for any information you might have, so please pass it on!

VIEW MY COMPLETE PROFILE

RECENT POSTS

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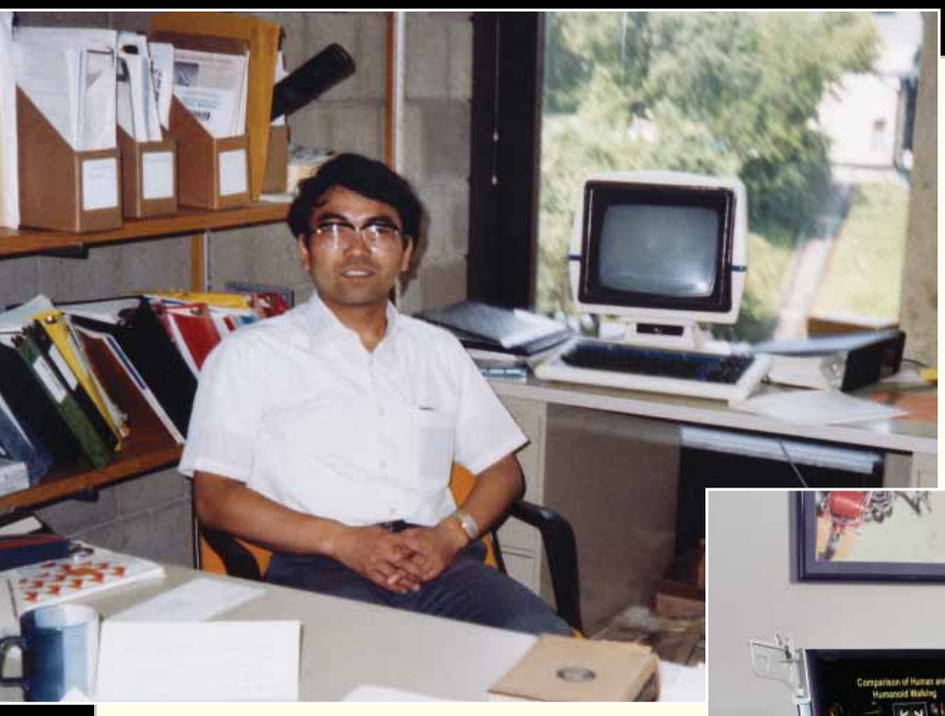
LINKS

Lyrics to the "Longest Path"
www.blazemonger.com

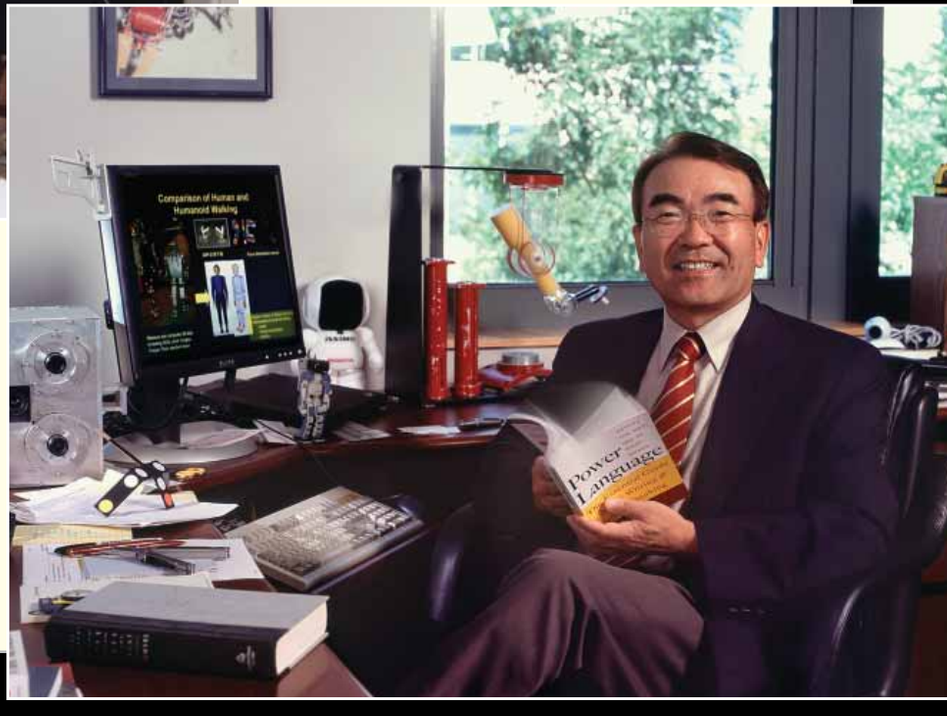
School of Computer Science
www.cs.cmu.edu

Then and Now



< 1980

New to the Carnegie Mellon faculty, the author of "Origami World" settles into his new office in Wean Hall.



2005 >

Takeo Kanade leafs through one of his favorite books for a Carnegie Mellon University Library promotional campaign. He is now the U.A. and Helen Whitaker university professor of computer science and robotics and one of the most widely referenced computer science professionals in the world. Look for our coverage of the symposium "TK60: Celebrating Kanade's Vision" in the next issue of The Link.

Carnegie Mellon
SCHOOL OF COMPUTER SCIENCE

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