CHAIR’S MESSAGE

The summer was a welcome break for all of us after a very busy spring semester. As we get ready for the new academic year, it is a good time to share with you some of the highlights of the last semester. We welcome the two newest additions to our faculty: Shivnath Babu and Landon Cox. Not only do they build upon our existing strengths in the area of computer systems, but they also provide crucial links between some of our key faculty members. Duke is not new to Landon, as he graduated from here in 1999. Welcome home, Landon! After serving the department for thirty-one years in various capacities, including Chair for three years, Alan Biermann has decided to retire. He will continue to remain active in the department and we thank him for his numerous contributions.

As Chair, it always gives me great pleasure to share the achievements of the members of our department. We are proud to announce that Herbert Edelsbrunner was elected to American Academy of Arts and Sciences, along with 195 other new fellows, including Chief Justice William Rehnquist and former NBC News anchor Tom Brokaw. He is the first member of the department to receive this honor. Alex Hartemink received the prestigious Sloan Research Fellowship, and Carla Ellis was elected to the Executive Committee of Computing Research Association (CRA). Thom LaBean was promoted to Associate Research Professor. The administrative staff has been hard at work as usual. Diane Riggs, our Graduate Program Coordinator, received a meritorious service award in the management category. We also welcome two new staff members: Camelia Pierson Eaves and Amber DeFusco.

We were fortunate to have great North Carolina weather for this year’s Spring Picnic. Prospective students were invited to attend and had the opportunity to get a feel of what Duke Computer Science has to offer, inside and outside the classroom, over a barbeque luncheon and Ultimate Frisbee match.

Duke Computer Science once again competed in the ACM World Finals, held in Shanghai, China. The team tied for second place among the 22 U.S. teams. Graduate students attended the CRA-W Cohort Meeting in San Francisco. They met for two days with senior researchers who shared pertinent information on the transition from student to researcher as well as more personal information and insights about their experiences.

We expanded our Industrial Partners Program (IPP) to include the Department of Electrical and Computer Engineering. The new program, called ‘inDuke’, held its inaugural meeting in May. By building upon the mutual strengths of the two departments, we anticipate the program to grow further and achieve great success in the next few years. Coupled with the inDuke meeting, the university held its annual Frontiers Technology Showcase, which this year featured the exciting research advancements in the Department of Computer Science and Pratt School of Engineering. We were honored to have Dr. Paul Horn, Senior Vice President and Director of IBM Research as the keynote speaker at this event.

Be sure to check out our Web site to learn the latest news about the department and to be part of our community. If you are in the neighborhood, we hope you will stop by for a visit. We look forward to hearing from you.

Best wishes,
Pankaj K. Agarwal
HERBERT EDELSBRUNNER
ELECTED MEMBER OF AMERICAN ACADEMY OF ARTS AND SCIENCES

HERBERT EDELSBRUNNER, Arts and Sciences Professor of Computer Science and Mathematics has been elected to the American Academy of Arts and Sciences. He is the first Duke computer scientist to receive this honor.

This year, academy members elected 196 new fellows and 17 new foreign honorary members. The 213 men and women are leaders in scholarship, business, the arts and public affairs, and include Nobel Prize-winning physicist Eric Cornell of the University of Colorado; Supreme Court Chief Justice William Rehnquist and Steven Squyres, leader of NASA’s Rover program for the exploration of Mars.

Founded in 1780 by John Adams, James Bowdoin, John Hancock and other scholar-patriots, the academy has elected as fellows and foreign honorary members the finest minds and most influential leaders from each generation. An independent policy research center, the academy undertakes studies of complex and emerging problems. Current academy research focuses on science and global security; social policy; the humanities and culture; and education.

Professor Edelsbrunner says, “I am greatly honored by the election and look forward to working with the Academy.” His research focuses on developing geometric and topological algorithms for applications in the sciences and engineering. During the last few years, his focus was on modeling proteins as geometric shapes. In a recent research milestone Professor Edelsbrunner, one of the founders of computational geometry, conceived of the idea of topological persistence, established fundamental properties of this concept, and applied it to develop a novel coarse protein docking algorithm. This new approach to structure gives unprecedented insights into the hierarchy of features that govern the workings of proteins and leads to a new language describing the motion proteins undergo in the process of folding.

In 2000, Professor Edelsbrunner also received a grant from the National Science Foundation to collaborate with researchers from Duke University, Stanford University, the University of North Carolina at Chapel Hill, and North Carolina A&T University on research into bioinformatics, applying information technology to solve the riddles of protein structure. In continuation of this effort and with a renewed focus on the mathematical foundations, Professor Edelsbrunner also received a grant from the Defense Advanced Research Projects Agency to collaborate with researchers from Stanford University, Rice University, the University of Minnesota, and the Georgia Institute of Technology to shed new light on the general problem of shapes and high-dimensional datasets. Both projects aim at understanding the biological mechanisms of illness, developing new ways to diagnose and treat diseases precisely.

The academy welcomed this year’s new fellows and foreign honorary members at its annual induction ceremony on Oct. 8, at the academy’s headquarters in Cambridge, MA.

THOM LABEAN
PROMOTED TO ASSOCIATE RESEARCH PROFESSOR

WE ARE PLEASED to announce that the Provost has approved the promotion of Thom LaBean to the rank of Associate Research Professor.

LaBean’s research focuses on three aspects of DNA engineering: self-assembly of DNA nanostructures for biomolecular computing, nanofabrication, and the use of DNA as a databasing material. Since silicon-based microprocessors are close to hitting their limits of speed and miniaturization, researchers are exploring the use of DNA (deoxyribonucleic acid) as a new material that will result in faster computing by enabling massively parallel computations.

Department Chair Pankaj Agarwal states, “Thom has been a valuable member of the department, and we wish him all the best for many more accomplishments in the coming years.”

LaBean earned his 1993 Ph.D. at the University of Pennsylvania. He received his B.S. at Michigan State University.
“ORACLE” COMPUTER COULD HAVE ALL THE ANSWERS BUILT IN

Instead of waiting weeks for computers to grind out solutions to complex problems, scientists may someday get answers instantly thanks to a new type of “oracle” computer that will have all the answers built in, predict Duke University computer scientists and engineers. When a question is posed, the computer will provide the answer already paired with the question in the very structure of the computer’s processing unit.

“We call this kind of computer an oracle because, like the oracles of ancient times, the computer is ready to answer your question as soon as you ask,” said Chris Dwyer, assistant professor of electrical and computer engineering and computer science at Duke. Dwyer said oracle processors will consist almost entirely of vast numbers of question-and-answer pairs. “At runtime, there will be no need to start from scratch, run a program, input data and perform computations,” said Dwyer.

Futuristic fabrication techniques that use DNA molecules to assemble vast numbers of electronic circuits simultaneously will make oracle processors feasible over the next decades, Dwyer said. “DNA self-assembly holds the promise of automatically producing trillions of electronic devices,” Dwyer said. “That’s why we can think about computing every solution to some kinds of problems when the computer is being assembled and building the answers in.”

Dwyer said such problems could at first include plotting efficient shipping routes and might eventually be extended to solving general problems such as computing the best schedule, designing the most efficient network and storing and retrieving data in the shortest possible time.

Coaxing strands of DNA into first building practical electronic circuits and then large-scale computers will not be easy, Dwyer said. The technique of “DNA self-assembly” takes advantage of the way complementary DNA strands always bind together according to the same rules — like complementary puzzle pieces fitting together. By creating selective DNA strands with “tags” that stick only to a desired location on another strand, scientists can launch a process that assembles the desired structure. The next stage of fabrication deposits metals or other conductors on the structure to complete the circuit.

“The same DNA binding rules (used to create molecules) can be used to actually compute results to problems,” Dwyer said. “That’s why it’s possible to think about computing all the solutions for a problem at fabrication time.”

“There are many challenges to overcome, but the oracle processor concept is powerful and attractive,” said Alvin Lebeck, associate professor of computer science and electrical and computer engineering. “Today’s computers do most of the work long after they are built, when the user submits a problem, loads data and waits. The oracle approach does most of the work long before the user even sits down at the computer, back at the time of fabrication.”

Lebeck said semiconductor technology is poorly suited to such an approach. Storing all the answers in a silicon chip would require a chunk of silicon far too large for foreseeable manufacturing methods. “Today’s computers have great flexibility because programmers can write code that lets users enter new information and get a new answer. Unfortunately, solving some problems takes weeks or months.”

DNA self-assembly is in its infancy, with many unresolved challenges, but it opens new possibilities, Lebeck said. “It has the potential to build processors such as the oracle that could solve some important problems with unprecedented speed,” Lebeck said.

Dwyer, Lebeck and their colleague Daniel Sorin, assistant professor of electrical and computer engineering and computer science, described the potential for shifting much of the computation to the time of fabrication in their paper, “Self-Assembled Computer Architecture and the Temporal Aspects of Computing,” in the January 2005 issue of IEEE Computer Magazine. The paper is part of the issue’s cover feature on “bleeding edge” developments.

Lebeck is principal investigator on a long-term project funded by the National Science Foundation to move DNA self-assembly beyond the bleeding edge and actually construct an electronic computing device through DNA self-assembly. According to Lebeck, the project is named Troika because it must balance three competing considerations in building DNA self-assembled computers: the regularity of the patterns such assembly can create, the variations needed to build complex computers, and techniques for overcoming the defects that are inevitable in self-assembly.

The Troika project includes Duke faculty members John Reif and Tham LaBean in computer science and Jie Liu in chemistry; Hao Yan of Arizona State University; Sean Washburn and Dorothy Ernie of the University of North Carolina – Chapel Hill; and Paul Franzen of North Carolina State University. Duke graduate students Vijeta Jhari, Jaidev Patwardhan, Sung-Ha Park, Nathan Sadler, and Constantin pistol are also contributing to the project.

“Realistically, we don’t expect practical DNA self-assembled computers for a decade or more,” Lebeck said. “But before you can arrange for DNA to assemble a computer, you have to understand what sort of computer you want the DNA to assemble. The oracle architecture is a promising step in that direction.”

Dwyer is principal investigator, with Lebeck as co-principal investigator, on a grant from the Air Force Research Laboratory to investigate the potential of oracle-type computations. Dwyer said he started thinking about DNA computing in his college years after reports of computer scientist Leonard Adleman’s 1994 demonstration of using DNA binding followed by chemical processes to compute a solution to a problem.

The possibilities of the oracle approach stuck Dwyer while he worked on his doctoral dissertation at UNC-Chapel Hill. He had been thinking for some time about “placing DNA computing and conventional computing in the same frame and seeing if there were natural connections. And the push from the self-assembly side of things, with the potential for huge manufacturing scale, came to be a strong motivator because it hinted something big was possible. It still is.”

Dwyer said he has always liked building things. “I was a math/chemistry/physics nut as a kid — chemistry kits, pyromania, the whole bit,” said Dwyer. “I bought an arc welder when I was 14 to build a submarine. I was always on some project that I couldn’t finish. That’s what I wanted most from my Ph.D., to finish something big.”

With the dissertation complete, Dwyer said, “I’d like to help finish something bigger, a working electronic computer assembled by DNA.”
The advent of my retirement has made me thoughtful about the university and our department. The changes that have occurred since I arrived have been profound. In 1974, our Chair, Don Loveland, was fighting with the administration over whether the Department of Computer Science should have a computer or not! Now, our system administrators tell me we have 650 machines in the department and every one of them is more powerful than a machine we would have purchased at that time. In those days, Duke was a well-known institution but not ranked anywhere close to the top ten. During the 1980s we climbed the ladder and made it into the list with the likes of Harvard, Yale, MIT, Stanford and only the order seems to change from year to year. In 1974, the fame of our faculty and our department. The changes that have occurred since I arrived have made me thoughtful about the university.

In addition to pursuing his own research interests in machine learning, graphical models, and computational systems biology, Professor Hartemink has dedicated a significant portion of his first four years at Duke to cultivating collaborations with people around the campus, and these collaborations are now starting to have a major impact. Work with Erich Jarvis in Neurobiology has already led to five joint publications, with another one on the way. Recently, Hartemink was granted a $1.6+ million computational neuroscience award from the NIH, in collaboration with Jarvis, to fund their efforts to understand vocal learning pathways in songbird brains.

A second extremely productive collaboration has emerged with Larry Corin in Electrical and Computer Engineering, along with Balaji Krishnapuram, a former graduate student now at Siemens Medical Solutions, and recently Professor Maria Figueiredo of Instituto Superior Tecnico de Portugal. This collaboration has yielded ten publications to date and has led to a number of important algorithms for state-of-the-art performance in a variety of feature selection and classification tasks in high dimensional spaces, with numerous applications in computational biology. Among these is new work with Randy Jirtle in Radiation Oncology and graduate student Philippe Luedi which has led to the first genome-wide prediction of imprinted genes in mice; the human homologues of a number of these predictions map into chromosomal loci that have been linked with a wide variety of human diseases, providing a virtual treasure map for researchers looking for disease-linked human imprinted genes. This work recently appeared in Genome Research, and was profiled in the Wall Street Journal.

On other fronts, contributions to the growing systems biology community at Duke have led to a new collaboration with Steve Haase in Biology centered around novel techniques for more accurate measurement of transcriptional progression through the cell cycle, while a collaboration with Ned Patz in Radiation Oncology and graduate student Pallavi Pratapa has led to a new algorithm for aligning proteomic MALDI mass spectra and identifying biomarkers that discriminate between cancerous and non-cancerous tissue samples. Partially in recognition of all these numerous contributions, Hartemink has already received an NSF CAREER Award, prior to being awarded the prestigious Alfred P. Sloan Fellowship.

"I enjoy collaborative research not only because I like working with others to solve challenging problems, but also because the applications in biology and medicine keep my work practically grounded, while simultaneously motivating new theoretical directions," Hartemink said. Research in Hartemink’s own group, with graduate students Allister Bernard, Leelavati Narlikar, David Vaughn, and Josh Robinson, has led to new insights in transcriptional regulation, protein-protein interaction, and transcription factor binding mechanisms.

Finally, Hartemink has worked closely with research associate Hans-Jurgen Sladecek to create a soon-to-be-released software package called Banja for the flexible and efficient inference of Bayesian and dynamic Bayesian network structures. Hartemink has led my work practically grounded, while simultaneously motivating new theoretical directions,” Hartemink said. Research in Hartemink’s own group, with graduate students Allister Bernard, Leelavati Narlikar, David Vaughn, and Josh Robinson, has led to new insights in transcriptional regulation, protein-protein interaction, and transcription factor binding mechanisms.

Finally, Hartemink has worked closely with research associate Hans-Jurgen Sladecek to create a soon-to-be-released software package called Banja for the flexible and efficient inference of Bayesian and dynamic Bayesian network structures. Hartemink said, “Banja will certainly accelerate our group’s research, but we’re giving it away for free for non-commercial use because we think it will be extremely valuable in a number of communities.”
WE ARE PLEASED to announce that Professor Carla Ellis has been elected to the executive committee of Computing Research Association (CRA). She is already a member of its Board of Directors. CRA is the leading association in computer science, computer engineering, and related fields whose mission includes strengthening research and advanced education in the computing fields and expanding opportunities for women and minorities.

“I am honored to be able to serve on the executive committee of CRA since it plays such an important role of advocacy for the computing research community. I don’t think most researchers are fully aware of all the things CRA does to influence policy-making that affects research, to promote graduate education, and to increase public awareness of the impact of innovative research in computing on the economy and society, in general. I am excited about the opportunity to contribute to these efforts,” Ellis said.

CRA’s mission is to strengthen research and education in the computing fields, expand opportunities for women and minorities, and improve public and policy-maker understanding of the importance of computing and computing research in our society.

The National Science Board (NSB) has announced that the Computing Research Association’s Committee on the Status of Women in Computing Research (CRA-W) will receive this year’s organizational Public Service Award. CRA-W has been committed to public service since 1991, serving close to 1,000 students and faculty members through programs aimed at increasing the participation of women in computing research.

Professors Mary Jean Harrold of Georgia Tech and Carla Ellis of Duke, the current co-chairs of CRA-W, accepted the National Science Board’s Public Service Award at a ceremony in Washington D.C. on May 25.
DUKE UNIVERSITY TO CONTINUE IPOD PROGRAM
By Jim Dalrymple, MacCentral

OFFICIALS FROM DUKE UNIVERSITY have announced that they would continue distributing Apple’s popular iPod digital device to students next year, albeit in a more focused manner. The decision was reached after a preliminary review of this year’s program where 1,600 20GB iPods were issued to all incoming first-year students.

“When people first think of the iPod, it’s a natural for music,” Richard Lucic of Duke University, told MacCentral. “My classes focus on Computer Science and we use the iPod in different ways, including moving large files so students can take them home.”

Lucic says the iPod initiative has done a couple of key things for the students. First, it is empowering the students to think on their own and come up with new ways to incorporate technology into their work.

Second, it allows students to access lectures and course material and keep it on their iPods for later use.

Peter Lange, the university’s provost and senior academic officer said the university would pay for next year’s program with funds previously set aside for strategic technology initiatives, rather than with operational or student funds.

DUKE FACULTY are supercharging course content with simulations of electrical signals racing through neurons, animations of figure skaters twirling to student software commands and performances of radio dramas resounding from iPods. Instructors demonstrated these and more than 30 other technological enhancements of education at the April 28 Instructional Technology Showcase 2005.

“This year’s presentations showed an increase in the use of audio and video to enrich courses and increased reliance on downloadable content to take the course to the student,” said Lynne O’Brien, director of the Center for Instructional Technology.

“Content can reach students with portable devices such as notebooks, PDAs (personal digital assistants) and iPods wherever they are working.”

O’Brien said use of downloadable content will grow because of new automatic download mechanisms such as “RSS” and “podcasting.” RSS (Real Simple Syndication) enables students to subscribe to “feeds” and receive new content as it becomes available. Podcasting delivers audio or video files rather than text. Computer science professor Richard Lucic, associate chair of computer science, gave a paper presentation on the distribution of course content with podcasting.

O’Brien said faculty are choosing from a growing menu of instructional technologies, including videoconferencing, digital imaging, digital video, PDAs, distance learning, simulations and the ubiquitous iPods. In poster sessions and panel discussions, a dozen faculty members described their experiences with iPods.

Vicki Russell, director of the Writing Studio, said in her course on how to teach reading and writing, “The most successful classes were the ones in which students played clips from actual tutoring sessions they had recorded with iPods.”

After students downloaded J. S. Bach’s “Saint Matthew Passion” to their iPods, said music professor Anthony Kelley, “I began to hear something I never heard in a Music 65 class — and I’ve taught this course three semesters. The students said, ‘Can we sing this?’”

Theater studies professor Daniel Foster played samples of classical radio dramas and original student works recorded on iPods. Foster said the students’ plays will be publicly available through podcasts on the internet.

John Moore, professor emeritus in neurobiology, demonstrated “Neurons in Action,” an instructional tool that includes simulations and moving graphs of electrical signals traveling through nerve cells.

One software tool, called Alice, is enabling students to bypass the frustrations of an introductory programming course by entering parameters in a template to control preexisting objects such as figure skaters, said computer science professor Susan Rodger, associate professor of the practice of computer science. “Alice allows you to learn basic principles of programming without getting bogged down in syntax errors,” Rodger said.

Graduating senior Kevin Fogg urged faculty to make greater use of commonplace technology such as AOL Instant Messenger and Microsoft Word.

“By using Instant Messenger, faculty can keep office hours even when they’re out of town,” Fogg said. “They can help several students at once.” Fogg said his generation finds it easier and faster to type instant messages than to use the telephone.

Students would also prefer to see instructors forego whiteboards and type more legible notes with Microsoft Word, projecting the notes during class and distributing the file to students afterward, said Fogg.

Keynote speaker Kenneth Green, director of The Campus Computing Project, a continuing study of information technology in higher education, said after three decades of investing in educational technology, legislatures and administrators are demanding assessment and accountability.

“The bill is coming due,” Green said.

O’Brien emphasized that CIT is committed to assessment of its projects. “All CIT-supported projects include an evaluation plan developed by the center’s staff with participating faculty,” O’Brien said. “For example, to look at the impact of iPod projects this year, we used faculty and student questionnaires, focus groups and classroom observations,” said O’Brien.
CS TEAM TAKES 2ND PLACE
AT SPELMAN COLLEGE COMPUTER SCIENCE OLYMPIAD

The Duke team, coached by Jeffrey Forbes, finished second out of 15 teams from 7 schools winning the Hardware/Software Integration and Web site Design competitions. For their performance, they each won a digital camera and a PocketPC.

The goal of the event was to give students the opportunity to make a connection between classroom learning and its real life applications. It also provided the time to network with fellow students from other institutions.

STUDENT PUBLICATIONS


R. Braynard, A. Silberstein, and C. Ellis. Wireless MAC-Layer Flexibility via Asynchrony and Asymmetry (poster). In NSDI.


H. He, J. Xie, J. Yang, and H. Yu. “Asymmetric Batch Incremental View Maintenance.” In ICDE ’05.


A. Meziner and D.J. Sorin. “Dynamic Verification of Sequential Consistency.” In ISCA.


STAFF

DIANE RIGGS RECEIVES MERITORIOUS SERVICE AWARD

President Brodhead presents Diane Riggs with her award.

GRADUATE PROGRAM Coordinator, Diane Riggs received a Meritorious Service Award in the Managerial category. She was recognized at the Presidential Awards luncheon on April 28. This award recognizes how much Duke values Diane. With her dedication, passion, and personal care, not only has she shaped the department's graduate program into a strong, vibrant, smoothly run program, she has also made students feel at home in the department. As Dean DeNeef concluded, “...Diane provides a steady source of compassion, nurture, steadiness, and sound advice. She is truly a model of an exceptionally effective manager.”

CAMELIA PIERSON EAVES HIRED AS ASSISTANT TO THE DIRECTORS OF UNDERGRADUATE STUDIES & 2ND FLOOR FACULTY ADMINISTRATIVE ASSISTANT

CAMELIA PIERSON EAVES is the newest addition to our administrative staff. She recently accepted the position of Assistant to the Directors of Undergraduate Studies. Camelia is responsible for assisting all faculty located on the second floor with various administrative tasks such as conducting financial paperwork and processing, supporting journal editors, maintaining databases, and more. She also assists with all aspects of the undergraduate program.

FROM LEFT TO RIGHT: NII AMPA-SOWA, BETH TRUSHKOWSKY, BRANDON JOHNSON, AND KAMARIA CAMPBELL.
DUKE CS COMPETES IN WORLD FINALS AND MASTERS CODE
By Paul Banner, The Herald-Sun

THREE DUKE STUDENTS stared at the problem: where to put cell phone towers so as to yield the fewest switches among them as a motorist talking on a cell phone drives any given route.

Obviously, a Voronoi diagram was called for, they realized. If only they'd included in one in the 25 pages of computer code notes they'd been allowed to bring with them into this hotel ballroom in Shanghai, China.

Surrounded by 77 other computing trios from universities around the world, they used ingenuity and a bit of improvisation. “We could use a binary search,” one of them suggested. The tactic, which finds things by dividing an area to be searched by half and the remainder by half again and so on, worked like a charm — better, the students agreed, than if they’d used Voronoi.

In fact, it worked well enough, along with the other solutions they achieved, to beat most other teams from U.S. universities in the World Finals of the Association for Computing Machinery International Collegiate Programming Contest April 3-7.

The team of Ben Mickle, Garrett Casto and Matt Edwards tied for second place with Cal Tech and MIT among the 22 U.S. teams, part of a 12-way tie for 29th in the world. The highest-ranking American team was from the University of Illinois, which tied for 17th internationally. The world title was taken by the University of Illinois, which tied for 17th internationally. The world title was taken by the University of Illinois, which tied for 17th internationally.

The team was especially gratified for second place with Cal Tech and MIT among the 22 U.S. teams, part of a 12-way tie for 29th in the world. The highest-ranking American team was from the University of Illinois, which tied for 17th internationally. The world title was taken by the University of Illinois, which tied for 17th internationally.

The contest, sponsored by IBM, is considered the Olympics of competitive coding.

The students write programs in the language known as C++, which has evolved from University of Illinois, which tied for 17th internationally. The world title was taken by the University of Illinois, which tied for 17th internationally.

For many of its veterans, participation can attract the attention of top software companies. A former Duke ICPC team member, Noam Shazeer, now works for Google and is the unsung hero of spelling-challenged computer users everywhere. He is responsible for the search engine’s polite query “Did you mean:?” when a user misspells a sought term. Mickle, a junior, interned last summer with Microsoft in Redmond, Wash., and plans to do so again this summer.

The Duke team is coached by Owen Astrachan, professor of the practice of computer science at Duke, which offers a course in algorithms, the step-by-step method of solving a problem that is at the heart of many computer programs. It also has a course in competitive coding.

The students write programs in the language known as C++, which has evolved from University of Illinois, which tied for 17th internationally. The world title was taken by the University of Illinois, which tied for 17th internationally.

The students write programs in the language known as C++, which has evolved from University of Illinois, which tied for 17th internationally. The world title was taken by the University of Illinois, which tied for 17th internationally.

By Paul Banner, The Herald-Sun
T H R E A D S

KEEP IN TOUCH!
If you received a degree from the Department of Computer Science, please fill out our on-line Alumni Registration Form. By being part of the CS alumni program you can network, chat with old friends, find out what the department is doing these days, and become a great resource for current CS students.

Whether it's a new position, a degree, a promotion, or a new addition to the family, we want to help you share the news!

Congratulations to the following alumni who have recently received new jobs.

2005
Ruoxi Chen
Investment Banking Analyst, Citigroup
Ryan Confer
Analyst, Goldman Sachs
Brian Gustafson
Software Design Engineer, Microsoft
Stephen Hulme
Web Programmer, CrossComm, Inc.
Rahul Mukherjee
Analyst, Bank of America
Franklin Winokur
Financial Analyst, Credit Suisse

2004
Anne Feldman
Solutions Analyst, Appian Corporation
Yun Fu
Yahoo!

2003
Vijeta Jahri
Layout Tools for Nano-Scale Circuity

2002
Yixin Gu
Consultant, Accenture

2000
Samuel Angiuoli
Bioinformatics Engineer, TIGR
Rager Obando
Self-Employed

1991
Lars Nyland
Associate Professor, Colorado School of Mines

GRADUATION 2005

PH.D. DEGREES:
Jef Hoerle
Co-advisors: Rachel Brady & Allen Song
Using AVID for 3D ROI Creation
Bryan Holland-Minkley
Advisor: Lars Arge
Cache-Oblivious Data Structures
Vijeta Jahri
Advisor: Alvin Lebeck
Layout Tools for Nano-Scale Circuity
Webin Pan
Advisor: Jun Yang
An Unsupervised Learning Approach to Author Name Disambiguation
Pallavi Pratapa
Advisor: Alexander Hartemink
A Comprehensive Analysis of MALDI-TOF Mass Spectral Data with Application to Cancer Diagnosis
Damia Xie
Advisor: Carla Ellis
Maintaining Accurate Field Monitoring with Sensor Networks
Hai Yu
Advisor: Pankaj K. Agarwal
Handling Time-Varying Data: Exact and Approximate Algorithms

UNDERGRADUATE DEGREES:
Ayonike Olutomi Akingbade
Saud Abdulaziz Al Shamsi
Andrew Illston Asadorian
Christopher Nelson Bond
William Howard Boyd
Grant Roque Colon
David Charles Eisinger
Tom Henry Giedgow
Samuel Curtis Heald
Paul Brian Heymann
Animesh Jain
Benjamin Jensen Kamens
Alberto Laverde
Spencer Charles Lynch
David Ross Martin
Mary K. McKee
Amy Caryl Nathanson
Daniel J. Park
Isaac Isuk Park
Charles Theodore Rahif
Shayla Charelle Sanford
Abhay A. Singh
Thomas Stuart Walther
William Barry Waters, Jr.
Ray Evans Williams
Franklin Steven Vinokur
Wenshuo Zhang

† Graduation with High Distinction
* Graduation with Distinction

STUDENTS

PH.D. DEGREES:
Yujuan Bao
Co-advisors: Xiaobai Sun & Kishor Trivedi
Adaptive Software Rejuvenation
Yun Fu
Advisor: Amin Vahdat
Resource Allocation for Global-Scale Network Services
Sathish Govindarajan
Advisor: Pankaj Agarwal
Spatial Data Structures and Algorithms for Large-Scale Applications
Tang Li
Advisor: Alvin Lebeck
Self-monitoring of Thread Interactions for Improved Resource Management in Multithreaded Systems
Lipyew Lim
Advisor: Jeffrey S. Vitter
On-line Methods for Database Optimization
Nabil Mustafa
Advisor: Pankaj Agarwal
Shapes: Simplification, Estimation and Classification of Geometric Objects
Vijay Natarajan
Advisor: Herbert Edelsbrunner
Topological Analysis of Scalar Functions for Scientific Data Visualization
Yusu Wang
Co-advisors: Pankaj Agarwal and Herbert Edelsbrunner
Geometric Methods in Molecular Shape Analysis
Rajiv Wickremesinghe
Advisor: Jeffrey S. Chase
Methods and Models for Reconfigurable Data Intensive Computing
Peng Yin
Advisor: John Reif
DNA Based Self-Assembly and Nano-Device: Theory and Practice

M.S. DEGREES:
Vinay Bansal
Advisor: Jeffrey S. Chase
G-SHARP: An Integration of Globus Toolkit with SHARP
Badrish Chandramouli
Co-advisors: Amin Vahdat & Jun Yang
Distributed Network Querying with Bounded Approximate Caching
Andrew Danner
Advisor: Lars Arge
I/O-Efficient Algorithms with Applications in GIS

† Graduation with High Distinction
* Graduation with Distinction
The JFLAP Faculty Adopter Workshop was held June 9–10 in the Department of Computer Science. JFLAP is educational software that allows students to explore formal languages and automata theory. The eighteen participants included JFLAP personnel, faculty adopters and educational evaluators. The workshop introduced faculty to JFLAP and discussed the upcoming two-year evaluation study to assess JFLAP’s effectiveness in learning formal languages and automata theory. In addition to Duke, the sites participating in the study are UC Davis, University of North Carolina, Rensselaer Polytechnic Institute, University of Houston, Emory University, U.S. Naval Academy, University of Richmond, Fayetteville State University, Norfolk State University, Winston-Salem State University, and Virginia State University.

A usage study of JFLAP demonstrated that since January 2003, there have been over 17,000 downloads of JFLAP from over 120 countries. Students and professors from over 100 U.S. colleges have been downloading JFLAP.

The JFLAP workshop is part of PI Susan Rodger’s $360,000 award from the National Science Foundation’s Education and Human Resources Division in the Course, Curriculum and Laboratory Improvement (CCLI) Program. Her three-year project is entitled “An Interactive Approach to Formal Languages and Automata with JFLAP.”

The ALICE Workshop was held at Duke June 11–12 in the Department of Computer Science. Alice (www.alice.org) is a 3D virtual world environment for learning how to program. The thirty participants included Alice personnel, college professors and high school teachers. The workshop introduced Alice for those who had not used it before, and discussed an evaluation study for the coming year to assess Alice’s effectiveness in generating interest in computer science. Wanda Dann from Ithaca College, Stephen Cooper from Saint Joseph’s University and Susan Rodger from Duke University acted as presenters.

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Spring Picnic

On Saturday, April 9 the department gathered at West Point on the Eno for its annual Spring Picnic. It was a chance to get acquainted with our prospective student visitors and enjoy a great spring day!
RESEARCH PROFILE

CIEL: SOFTWARE FOR VISUALIZING PROTEIN-PROTEIN INTERACTIONS
by Yih-En Andrew Ban

A KEY DECISION must be made in any study of protein–protein interactions at the molecular level — the definition of the interfacial region of interest. Standard interfacial definitions using absolute distance or solvent excluded surface area incorporate a threshold set by the investigator. As a result, the interfacial region varies from study to study. These definitions can therefore be considered somewhat arbitrary in nature. In addition, interfaces defined in these ways may be fractured in a manner which is difficult to interpret. To address these issues we develop an alternative definition using concepts taken from computational geometry and topology. Through the use of a relative distance threshold, we define the interfacial region of a protein–protein complex by an interface surface which is symmetric, orientable, and has a defined decomposition [1].

Ciel is a new software package for generating these interface surfaces from protein structural data. The package includes a core implementation written in Java and a visualizer (Bianca) written in Java3D. The software requires only modest computing resources and is robust and accurate, performing calculations in arbitrary precision when necessary.

Modules implemented in Ciel to generate interface surfaces include Delaunay triangulation in 3D for balls and points, Alpha Shape generation, and topological persistence (as applied to Alpha Shapes). Input to Ciel is by standard PDB file. Multimeric complexes are supported and an arbitrary number of chains may be included. Following generation, interface surfaces may be visualized in the included visualizer and may also be exported to file formats for protein visualizers such as KiNG [3], VMD [4], and PyMOL [5].

The Bianca visualizer included with Ciel is the easiest and most direct way to view interface surfaces in the context of protein structure. The interface surface and boundary, Delaunay edges dual to the interface surface, and retracted complexes may all be viewed in the context of the interface surface filtration, which is dynamically changeable by slider. The Alpha Shapes of the protein–protein complex may be viewed as well. One feature of interest in Bianca is the interaction graph, which shows all interactions involved in the protein–protein interface at the residue level. The interaction graph dynamically changes with respect to the user’s currently selected rank in the interface surface filtration, offering a useful visual aid to quickly focus in on the more critical, interior regions of the interface. Residues are also selectable within the interaction graph, which then highlight the chosen residue and its interaction in the main visualization window. Arbitrary numbers of interface surfaces may be simultaneously loaded into Bianca, facilitating comparison between interface surfaces of different protein–protein complexes.

Ciel is available in binary from the Biogeometry website. Source code will be forthcoming, with a planned release date in the first quarter of 2006.


WILL TELEPHONE NUMBERS SOON DISAPPEAR?

TELEPHONE NUMBERS will become a thing of the past if several Duke Voice Lab researchers have their way. Professor Alan Biermann, working with Ashley McKenzie and Bryce Inouye, has developed a system that enables telephone callers to simply speak the name of the person they wish to talk to and the system will connect them. If the system has difficulty understanding who is being asked for, it will ask the caller to spell their first and last names.

The system employs a speech recognizer by Nuance Corporation and uses a statistical technique to correct errors that may occur in the speech recognition process. In order to demonstrate the power of this technology, the university set up a phone number for the months of June and July that enabled connection to any of Duke’s 35,000 employees.

This system has been used by many people and its success rates will be published when the experiment is over. Our researchers are interested in the following application for this technology: Suppose you do not use a telephone but instead have a sleeping microphone in your presence at all times which can be activated by a key phrase such as “telephone-connect”. Then at any time in your daily activities you could say “telephone-connect John Smith” and immediately be talking to that person. Suddenly, your environment will effectively include every person your phone system can access.
**ALEX VASILOS MEMORIAL AWARD**

Friends and colleagues of the late Alex Vasilos, donated the Alex Vasilos Memorial Award to the Department of Computer Science to recognize deserving students.

**Ayonike Akingbade**

For her excellence in academic achievement and for her contributions to the undergraduate program.

**OUTSTANDING UNDERGRADUATE TEACHING ASSISTANT AWARD**

**Jessica Smith**

In recognition of her overall excellence and leadership.

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**GRADUATION SENIOR THESIS PROJECTS**

Graduation with Distinction is awarded to students who complete a substantial project, representing at least one year’s work and includes at least one independent study, under the guidance of a faculty member. The project represents a significant intellectual endeavor and a presentation made to a committee of three faculty members.

**GRADUATION WITH HIGH DISTINCTION**

**Christopher Bond**

Advisor: Jun Yang

Query Suspend & Resume

**Paul Heymann**

Advisor: Alexander Hartemink

Towards a Social Protocol

**GRADUATION WITH DISTINCTION**

**Benjamin Jensen Kamens**

Advisor: Robert Duvall

Duke IM - Academic IM Server

**Franklin Steven Winokur**

Advisor: Robert Duvall

Duke IM - Academic IM Server

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**GRADUATION 2005 HONORS RECIPIENTS**

Graduates pictured clockwise: Christopher Bond, Benjamin Kamens, Franklin Winokur, and Paul Heymann