Duke Computer Science is a whirlwind of activities as usual. We are extremely proud of our faculty who have been honored over the recent months. John Reif, A. Hollis Edens Distinguished Professor of Computer Science, has been elected Fellow of the American Association for the Advancement of Science; Lars Arge has been promoted to Associate Professor with tenure; Jun Yang has received an NSF Faculty Early Career Development (CAREER) Award; Jeffrey Chase has been awarded a 2003 IBM Faculty Award; Alvin Lebeck, working with Dan Sorin, John Reif, and others has won a mid-size NSF ITR grant for research in computer nanorarchitectures. Other faculty members have won substantial grants for the continuance of various research programs.

We also have an exceptional group of students who are winning their own honors. We have a social issues campaigner among our graduate students—Justin Moore has gone on-line to protest the electronic voting systems that are being sponsored by Diebold, Inc. and warned of their lack of security. We are especially proud of Ethan Eade, a senior with majors in computer science and mathematics, who received a Faculty Scholar Award at Duke and was named the Computing Research Association runner-up for the CRA Outstanding Undergraduate Award. Our renowned programming team won second place among 160 teams in the ACM Mid-Atlantic Programming Contest. The team qualified to compete in the World Finals in Prague, The Czech Republic, later this year. Special thanks to our team coach, Owen Astrachan, for his work in preparing this team and Thomas Gallie for his continued support of our programming team.

Please keep us informed of your professional and personal news—we are always eager to hear from our alumni and partners, and be sure to check out our Web site to learn the latest information about the department.

Sincerely,
Alan Biermann, Chair
Reif Receives Rank of AAAS Fellow

A. Hollis Edens Distinguished Professor of Computer Science, John Reif has been elected to the rank of AAAS Fellow (American Association for the Advancement of Science).

Each year the Council elects members whose “efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished.” Reif is being honored for many fundamental contributions to a wide range of emerging areas in computer science, including robotic motion planning and parallel computation.

Researchers Power Up Server Clusters

Software being developed by Associate Professor Jeffrey Chase could help spur so-called utility computing technology that promises to offer users self-managing systems that grow and shrink in response to user demand. For over a year Chase has worked on software that lets users share clusters of computers by creating multiple virtual systems out of a single physical pool of servers.

Called Cluster-on-Demand, the software separates the entire software environment, including the operating system and applications, from servers. To put it simply, the servers boot via the network and hook into a database that tells them what operating system to run, what software to load, what policies to adhere to and other details. As a result, the computing resources can be used for whatever applications demand them, Chase says.

“Cluster-on-Demand treats the operating system as a replaceable component that can be configured based on the needs of the user,” Chase says. “We treat hardware as generic… We want to allow companies to be able to view their clusters as a multipurpose, modular dynamic resource, rather than as a brittle computing resource bound to specific software environments.”

Lebeck and Team Awarded ITR Grant

Associate Professor Alvin Lebeck, and his interdisciplinary team of co-PIs, has been awarded a competitive, mid-size NSF ITR grant for their research project titled: “Nanoarchitecture: Balancing Regularity, Complexity and Defect Tolerance using DNA for Nanoelectronic Integration.”

DNA Makes Nano Barcode

To keep Moore’s Law going—the tenet that computer speed will roughly double every 18 months—manufacturers must make faster circuits, and that usually means making them smaller. If an electronic signal has less distance to travel, it will make the trip more quickly. But as the components that make up electronic devices grow smaller it is becoming increasingly difficult for manufacturers to assemble them using traditional lithography methods, which use light and chemicals to etch materials into shape. Another tack is assembling materials from the bottom-up, molecule-by-molecule.

Professor John Reif and his team of Assistant Research Professors Hao Yan and Thomas LaBean, and lab assistant Liping Feng have moved the bottom-up method a step forward by programming strands of synthetic DNA to self-assemble into a structure that makes the pattern encoded in a DNA strand readable by microscope.

The method could eventually be used to make templates that will enable molecule-by-molecule construction of electronic circuits. The method could be ready for practical use in five to eight years, according to the researchers. The work appeared in the June 23, 2003 Proceedings of the National Academy of Sciences.

Duke Scientists ‘Program’ DNA Molecules to Self Assemble into Patterned Nanostructures

Duke University researchers have used self-assembling DNA molecules as molecular building blocks called “tiles” to construct protein-bearing scaffolds and metal wires at the billions of a meter, or “nanoscale.” The achievements in nanoscale synthesis, which the five authors said could lead to programmable molecular scale sensors or electronic circuitry, were described in a paper in the September 26, 2003, issue of the Journal Science written by Hao Yan, Thom LaBean, Gleb Finkelstein, Sung Ha Park and John Reif.

The Duke group’s research was funded by the National Science Foundation, the Defense Advanced Research Project Agency, and Taiko Denki Co., Ltd. Fashioning protein nanoscaffolds and silver nanowires may be only the beginning, because tiles of this form “can be easily programmed by varying the sticky ends to form more sophisticated arrays,” the authors wrote.
University, say the machines are sub-
ist, and colleagues from Johns Hopkins
presented a scary picture of where the
versity computer scientist Dan Wallach
mented despite numerous warnings.
Flawed, vulnerable computer voting
systems are still going to be imple-
tion.

Computer Voting Systems?
Will Your Vote Count with
federal money to buy these computer
machines. States are using one-time
"Democracy is riding on these voting
machines before and after the elec-
tion two - would require only a few
minutes of unrestricted access to the
machine, which would allow hackers to make
counts impossible because they don't include paper bal-
loons. Wallach spoke October 31, 2003
at Duke during a seminar sponsored
by the Department of Computer Sci-
ence.

Despite the alarms sent up by Wallach
and other computer scientists, several
states are moving forward with pur-
chases of paperless computer voting
machines.

Will Your Vote Count with

Similarly, security is a concern. To
launch an outside attack - for example,
to change the software so that votes
for candidate one go instead to candi-
date two - would require only a few
minutes of unrestricted access to the
machines before and after the elec-
tion.

"Democracy is riding on these voting
machines. States are using one-time
federal dollars to buy these computer
voting systems that are deeply flaw-
ed," Wallach said.

Justin Moore has joined a small group of individuals united in pro-
test against the allegedly incompetent and undemocratic practices
of Diebold, Inc., the world’s self-professed leading voting solutions
provider. Moore and a few dozen others across the country have
used university Web sites to post revealing and possibly embar-
rassing internal memoranda from Diebold employees. The camp-
aign is organized on-line and has elicited a bevy of cease-and-
desist letters from Diebold, which claims the memoranda were sto-
len, according to The Chronicle of Higher Education. Moore said he
has not yet received word from Diebold’s lawyers, but he is ner-
vous given the “very, very stiff” penalties for copyright infringe-
ment that he could conceivably face. “I do have a family; we do
have a house,” he said. “But I wouldn’t be doing this if I didn’t
think... this is at the heart of our democracy.” The controversy
surrounding Diebold began last spring when a team of computer
scientists at Johns Hopkins University and Rice University under-
took a security audit of the source code of the company’s voting
machine software, which Moore said was available to the public on
the Internet. The computer scientists were stunned at the lack of
adequate security for the software.

Moore, who is currently co-teaching a computer science course
that addresses intellectual property and the Internet, said he is
confident that he is functioning within the parameters of the law.

"This is non-commercial political speech, which traditionally gets
very, very high protection under the First Amendment,” he said.

Will Your Vote Count with Computer Voting Systems?

Grad student at center of Diebold controversy

Master’s and Ph.D. Degrees:

September 2003
Laura Julia Toma, Ph.D.
Advisor: Lars Arge
I/O Efficient Graph Algorithms
with Application to Geographic
Information Systems

Jing Zhang, M.S.
Advisor: Jun Yang
Implementing a File System on
Top of a DBMS

Zihui Wang, M.S.
Advisor: Jun Yang
Multiple View Maintenance with
Semantic Caching

December 2003
Ronald Doyle, Ph.D.
Advisor: Jeffrey S. Chase
Model-based Adaptive Resource
Provisioning in a Web Service Utility

Ashish Gehani, Ph.D.
Advisor: Gershon Kedem
Support for Automated Passive
Host-based Intrusion Response

Ken Yocum, Ph.D.
Advisor: Jeffrey S. Chase
Anypoint: A Network Communication
Model for Internet Services

Adolfo Rodriguez, Ph.D.
Advisor: Amin Vahdat
Building Scalable and Adaptive Network
Services

Emma Buneci, M.S.
Advisors: Xiaobai Sun/Marty Woldorff
Functional Magnetic Resonance Imaging:
Component-wise Models of the BOLD Response
in the Human Primary Visual Cortex

Jagadeeswaran Rajendiran, M.S.
Advisor: Carla Ellis
SELFLESS: Self-organizing Low Energy Smart
Sensor Systems

Priya Mahadevan, M.S.
Advisor: Amin Vahdat
MobiNet: A Scalable Emulation Infrastructure
for Ad Hoc and Wireless Networks

Jeannie Albrecht, M.S.
Advisor: Amin Vahdat
Developing and Evaluating Novel Network
Protocols on Wide-area Testbeds

Patrick Reynolds, M.S.
Advisor: Amin Vahdat
Measurement and Causality in Black-box
Distributed Systems

Ronald Bryce Inouye, M.S.
Advisor: Alan Biermann
A Framework for Handling Mixed Initiative and
User Modeling in the Missing-Axiom Theory of
Dialog Modeling

Shumin Wu, M.S.
Advisor: Alan Biemann
Learning Applications to Automated Dialogue
Systems

TechConnect 2003

TechConnect 2003 was hosted by
Duke University’s Career Center, Pratt
School of Engineering, and Depart-
ment of Computer Science.

The event allowed students the op-
portunity to network with company
recruiters. A panel consisting of in-
dustry representatives from Eli Lilly,
ExxonMobil, GE Medical Systems, GM,
Microsoft, and Nortel presented tips
and techniques for searching, inter-
viewing, and choosing a job. A recep-
tion followed the panel discussion
where students had personal inter-
actions with industry recruiters.

Sponsors:
Eli Lilly
ExxonMobil
GE Medical Systems
GM
Microsoft
Nortel

Graduates

Congratulations
2003

GRADUATES
Duke senior Ethan Eade is the winner of a Marshall Scholarship, which finances two years of study in the United Kingdom. Up to 40 scholars are selected each year to study either at the graduate or, occasionally, the undergraduate level in any field. Marshall Scholars are considered potential leaders and decision-makers.

Eade is a computer science and mathematics double major who hopes to become a professor of computer science at a major research university. He plans to enroll in the engineering department at the University of Cambridge to pursue a master’s degree in information technology.

This spring, Eade was one of four Duke students selected for the Barry M. Goldwater Scholarship in Science, Mathematics and Engineering. The $7,500 scholarship is a merit-based award given to undergraduates planning research careers in mathematics, engineering or the natural sciences. Up to 300 students nationwide win the award each year. Eade is also the winner this year of a Faculty Scholar Award, which represents “the highest honor that the faculty of Duke University can bestow upon its undergraduates. The award is presented for ‘intellectual leadership and a record of scholarly accomplishment.’”

Robert Thompson, dean of the Trinity College of Arts & Sciences, said Eade “is viewed with the greatest respect — in some cases approaching awe — by teachers in computer science and there seems little doubt that he will join them before long as professor. He has already made significant contributions in robotics and distributed systems and he is genuinely excited by the prospect of graduate study where he can move ahead with his research.”

Self-assembling Circuits Using DNA May Represent Next Computer Breakthrough

The same DNA that carries genetic information may assemble electronic components when they become so minuscule that current manufacturing techniques no longer work, said researchers working on a $1.2 million project funded by the National Science Foundation to develop processes for submicroscopic DNA assembly. Associate Professor Alvin Lebeck and Co-Investigator and Professor of Computer Science John Reif are aiming to use the innate self-assembling properties of DNA to transport submicroscopic carbon “nanotubes” into place to function as transistors and connectors in computer circuitry.

The project is named “Troika”, after the three-horse Russian sleigh. Three universities are participating — Duke, the University of North Carolina - Chapel Hill, and North Carolina State. According to Lebeck, the Troika team is planning to build circuits from carbon nanotubes, which are rolled-up sheets of carbon atoms with walls only one atom thick. The researchers will use carbon nanotubes made with atomic arrangements that enable them to behave like transistors. They will be designed to perform basic functions in a circuit such as acting as gates, which change the value of their output depending on inputs. They will use other nanotubes designed to be highly conductive to connect the transistors.

Wouldn’t it be nice to catch up with old friends and colleagues? Well now you can.

By being part of the CS alumni program you can network, chat with old friends, find out what the Computer Science department is doing these days, and become a great resource for current CS students.

Remember that any news is news worth sharing. Job changes, marriages, and births are notable but don’t forget to let us know about a special anniversary, an award-winning paper, a role in a local theater production and more!

Visit us online to add or edit your information: www.cs.duke.edu/espeople/alumni/alumnireg.html

Ethan Eade: 2004 Outstanding Male Undergraduate Award Runner-Up

The Computing Research Association honors the recipients of the CRA Outstanding Undergraduate Awards competition for 2004, sponsored this year by Mitsubishi Electric Research Labs.

Ethan Eade, Duke University, was named Runner-Up for the male award.

Ethan is a senior at Duke University. He will receive a Bachelor’s degree with majors in both Computer Science and Mathematics in spring 2004. As a 2003 Marshall Scholar, he will attend the University of Cambridge in fall 2004 where he will study robotics and distributed systems.

Ethan is interested in multiple areas of computer science and has contributed foundational research to several projects. For the ModelNet project, a large-scale wide-area network emulation system built on commodity hardware, he researched the application of graph partitioning to the assignment of network links to multiple computers. Ethan was co-author of a paper resulting from ModelNet published at MASCOTS ’03, lead author of a paper on peer-to-peer networks and distributed event notification at ICS’03, co-author of a paper on navigation algorithms at ICRA 2003, and will co-author a paper on developing a programming environment for beginning students.

Ethan maintains a 4.0 grade point average in Computer Science and is currently ranked seventh in his class at Duke. He has been named to the Dean’s List every semester and has received numerous scholarships and awards, including the Angier B. Duke Memorial Scholarship and the Barry Goldwater Scholarship. He served for two summers as an undergraduate research assistant and served as a summer intern at Cape Computing, Inc. Ethan is president of the Duke Robotics Team and is an avid musician, playing in the Duke Symphony Orchestra as principal trumpet, in student musical productions as trumpeter and orchestral director, and in various other musical groups.