The year 2001-2002 has been spectacular for the Department of Computer Science. We began by celebrating the achievements of our former Chair, Jeff Vitter, who joined us in January of 1993 and brought us to a U.S. News and World Report ranking of 20th in the nation, 16th in computer science theory. Jeff set a high standard for the Department from the beginning and we have hired at the level of best-in-the-country during these years in an effort to build our strongest faculty ever. For the current year, we brought in Alex Hartemink, from MIT, who is a specialist in computational genomics, and Jun Yang, from Stanford, who is an expert in database theory. We also hired Carlo Tomasi, a well-known researcher in computer vision, as a senior faculty member who will be joining us this fall. Jeff led us in the redesign of our graduate program and the creation of our very successful Industrial Partners Program, which is managed by Richard Lucic.

As the new Chair, I have endeavored to keep the ball rolling and have been supported wonderfully by my Assistant, Susan Clear, Administrative Manager, Jewel Wheeler, and Associate Chair, Richard Lucic. Our big projects have been to continue to

(continued on next page)
The Department has been the lucky recipient of a new iRobot All Terrain Robot Vehicle, an ATRV-Junior donated by Science Applications International Corporation (SAIC). This rugged machine features a laser range-finder, sonar sensing, stereo vision, and a series of other attachments that make it a versatile research vehicle. Alan Biermann introduced this system to the department in a research seminar during the spring semester where students learned robot theory and practice. Various student projects were aimed at navigation, map making, localization using a map, vision, and spoken language control. Many of our second floor faculty witnessed the robot, which has been named “Markov” after the famous mathematician, traveling past their office doors this spring.

In the coming semesters, “Markov” will be used as a research vehicle by our artificial intelligence faculty, especially Ron Parr and Carlo Tomasi. Our thanks go to SAIC and Senior Vice President, Dr. Clinton W. Kelly III, who has played a major role in our Industrial Partners Program over the last several years.

Students who participated in the project included:

- Justin Caton
- Chelsey Durgin
- Mark Fashing
- John Fath
- Michael France
- Thomas Gamble
- Paul Macwilliams
- Matthew Palombi
- John Royall
- David Winarsky
- Joel Winegrarden

Owen Astrachan received his second outstanding teaching award, the Richard K. Lublin Teaching Award.

This newsletter will describe many of our activities from the year. One that I am most proud of is that our undergraduate programming team went to the ACM International Collegiate Programming Contest World Finals for the seventh time in eight years. This year they traveled to Hawaii, where they took eighth place with only two U.S. teams ranking ahead of us: MIT and Stanford. Congratulations to the team and to Owen Astrachan, their advisor and coach. Many thanks to Tom Gallie, faculty emeritus, whose generous donation to the department has supported the team and its activities.
Computers Made From DNA?

Computers made from DNA? Molecular LEGO systems? That’s the vision of John Reif, a professor of computer science at Duke who currently directs two large federal research projects on using DNA for “biomolecular computing.” In a commentary in the April 19 issue of *Science*, Reif wrote that “molecular computation is not a far-fetched possibility, but a quickly evolving discipline which may have major impact on more established disciplines such as biotechnology.” He explained to Monte Basgall for *Dialogue* where his research is heading.

**Dialogue:** People may know DNA as the component molecule for genes. But why and how can one use DNA molecules as calculating tools?

**Reif:** DNA is a sequence of four types of “bases,” and two of the base types pair very selectively with two others. Using this property, you can design strands of DNA that bind very selectively with other strands. That provides the ability to construct molecule-scale structures, called “nanostructures,” out of DNA since this selective linking can be predictable.

**Dialogue:** Can molecular computation with DNA work much faster than conventional supercomputers?

**Reif:** Each step in DNA computation is actually vastly slower than on a conventional computer. Each step might take at least a few seconds and often up to twenty minutes. A conventional high-performance computer can now run at a few billion operations a second. Nevertheless, the much higher degree of molecular parallelism of DNA computation would allow rates from a few million to a billion times faster than using a conventional computer. That’s impressive. Our goal is not to compete directly with conventional computers, however, but to provide abilities that are unobtainable in conventional ways.

**Dialogue:** Projects you’re directing in biomolecular computation are now receiving about $2 million in research support from each of two agencies: the National Science Foundation (NSF) and the Defense Advanced Research Projects Agency (DARPA). What would motivate federal agencies to invest that kind of money?

**Reif:** I think the application that’s most in the eye of the NSF and DARPA is building molecular electronic assemblies. The DNA would not do anything electronic. Instead, the DNA nanostructure would provide a superstructure for circuitry much more miniaturized than is possible today. We’ve been able to assemble regularly patterned two-dimensional DNA nanostructures and image them using atomic force microscopes. We have also been able to assemble gold particles on these nanostructures. Such tiny metal particles might someday provide electrical connections between nanocircuits.

**Dialogue:** You are also receiving funding for biomolecular computation using DNA, aren’t you?

**Reif:** The NSF grant is more related to DNA computation applications, whereas, the DARPA project is more for the goal of forming large-scale and patterned two-dimensional nanostructures. But, in both cases we use DNA tiles.

**Dialogue:** Your commentary in the April 19 *Science* noted that a research paper published in the same issue provides “by far the largest-scale demonstration to date of the capabilities of DNA computing,” one involving the satisfaction of a “satisfiability” problem. What is a satisfiability problem?

**Reif:** A satisfiability problem is just a logical formula that has some variables which can take “Boolean” values — either they are true or false. We often reason in terms of this type of Boolean logic. Formulas of this sort can express a wide variety of logical problems. In this case, the demonstration solved a logical formula that involves twenty such variables.

**Dialogue:** Could you provide an example?

**Reif:** You could take sample strands of DNA from various cells of groups of people. Those strands of “natural” DNA would then be “stuck” with “tags” of synthetic DNA strands that encode Boolean properties. The tagged DNA strands would all be combined into a single test tube, where you could literally have millions of billions of such strands. Then you could run a “query” by separating out from the test tube those DNA strands whose tags satisfy certain properties defined by a given Boolean formula. That might be useful for finding DNA from individuals with a specific disease type or cell type, or a combination of those. Such a task cannot be done by conventional computers since they do not operate directly on DNA.
The 2001 Herbrand Award for Distinguished Contributions was presented to Dr. Donald Loveland for his development of the model elimination procedure, for his contributions to propositional satisfiability testing realized in the Davis-Putnam-Logemann-Loveland Procedure, for his work on the near-Horn Prolog family of calculi for disjunctive logic programming, and many other contributions to the field of automated reasoning. The Herbrand Award is the most prestigious award in the field of automated reasoning and deduction.

Three new faculty members have joined the Computer Science Faculty. These new additions complement our already strong program with their expertise in the promising fields of computational biology and computational genomics, artificial intelligence, computer vision, and database systems. Professor Alexander Hartemink earned a Ph.D. from the Massachusetts Institute of Technology in 2001, an S.M. from MIT in 1997, an M.Phil. from Oxford in 1996, and a B.S. and A.B. from Duke University in 1994. He was a Rhodes Scholar, White House Presidential Scholar, NSF Graduate Research Fellow, Barry M. Goldwater Scholar, Angier B. Duke Scholar, and Kalin Award recipient. Professor Carlo Tomasi received his Ph.D. from Carnegie Mellon University in 1991, and a “Laurea” degree with honors in Electrical Engineering from the University of Padua, Italy in 1981. Since graduation he has served as an Assistant Professor of Computer Science at Cornell University (1991-1993) and Stanford University (1994-2001). Professor Jun Yang earned his Ph.D. from Stanford University in 2000 and a B.A. from UC Berkeley in 1995. His honors and awards from UC Berkeley include the Computer Science Division’s Highest Achievement Award (1995), and the UC Berkeley Chancellor’s Scholar Award.

Dr. Brian Cantwell Smith, computer scientist, philosopher and a former principal scientist at the Xerox Palo Alto Research Center in California, has been named the new Kimberly J. Jenkins University Professor of New Technologies and Society at Duke University.

Dr. Jeffrey Forbes holds the honor of being named one of the CIT Faculty Fellows for the upcoming year. The Instructional Technology Fellows program provides extended help and incentives to a group of instructors who wish to bring about significant educational change in a course with the use of new technology.

The Richard K. Lublin Teaching Award, one of four teaching awards given out by Trinity College, has been presented to Dr. Owen Astrachan for 2001-2002. Highly regarded by students and colleagues, Dr. Astrachan possesses the qualities necessary to achieve success in the classroom. The selection criteria for the award are stated as the “ability to engender genuine intellectual excitement, ability to engender curiosity, knowledge of field and ability to communicate that knowledge, organizational skills and creative arrangement of course.”
A sea of caps and gowns filled the LSRC lawn Sunday, May 12, 2002. Proud parents and supportive friends eagerly waited for the Computer Science Diploma Ceremony to begin. Some friends and families simply had big proud grins on their faces while others enthusiastically held up handmade signs, yelling and screaming as students’ names were called. Faculty, staff, students, and even faculty spouses gave up their Mother’s Day to help out with graduation festivities. The luncheon went smoothly and was a big hit thanks to all of their help. The graduated students will be sorely missed but we wish them much luck and success in their future. Congratulations!

Alex Vasilos Memorial Award

Friends and colleagues of the late Alex Vasilos donated the Alex Vasilos Memorial Award to the Department of Computer Science. Alex worked in the computer industry for more than 20 years at IBM, The Object People, and BEA Systems. Although he was not a technical guru, Alex was known to his friends affectionately as “The Wolf” and was simply the best negotiator of business deals that any of his co-workers had seen in their careers.

“We all knew how lucky we were to have such a dedicated individual and brilliant mind acting on our behalf. We could think of no better way of memorializing Alex than a scholarship in the Computer Science Department at Duke. Outside of work his passion was basketball, and he followed Duke avidly.”

–The Friends of Alex Vasilos

Alex Vasilos Award For Outstanding Academic Achievement

Andrew Hughes Chatham

Andrew Chatham completed a research independent study under Dr. Lars Arge. His research led him to co-author a research paper, Efficient Object-Relational Interval Management and Beyond, which has been submitted to a top database conference. Andrew has been active in the student chapter of Duke ACM, including the leadership role of President in 2000. He was a member of the winning team of the regional ACM programming competition in November 2001. The team continued on to win eighth place in the International Competition in March 2002. Some of Andrew’s other honors include Honorable Mention in the CRA Outstanding Undergraduate Award Competition, NSF Graduate Scholarship, and the Barry M. Goldwater Scholarship. Based on his senior thesis work, he is Graduating With Highest Distinction. Andrew plans to work for Google and will pursue a graduate degree in computer science starting in the fall 2003.

Alex Vasilos Award For Excellence in Undergraduate Program Support

Ted Shion Hung

Ted Hung worked as an undergraduate research assistant under Dr. Susan Rodger in the summer of 1999. He co-authored a paper based on the results of his research, Increasing Visualization and Interaction in the Automata Theory Course. The paper was accepted and presented at the 31st SIGCSE Technical Symposium on Computer Science Education. Ted was an undergraduate teaching assistant for several computer science classes and was active in the Duke student chapter of ACM including two officer positions; Secretary in 1999 and Vice-President in 2000. He is continuing his computer science education by attending Carnegie Mellon University in the fall to pursue a M.S. degree in Entertainment Technology.
Senior Thesis Project

Andrew Chatham
Graduation With Highest Distinction
*Efficient Object-Relational Interval Management*

Jer-Yee Chuang
Graduation With High Distinction
*Improving The Search For Graphical Models of Genetic Regulatory Networks*

Stefan Negritoiu
Graduation With Distinction
*Architecture, Design & Implementation For Distributed Applications*

Nikita Tovstoles
Graduation With Distinction
*Computefarm: JXTA-Based Distributed Computation Platform*

John Tran
Graduation With Distinction
*STAR-Tree and Protein Shape Matching*

Joshua Watkins
Graduation With Distinction
*Java Extreme: Sawtooth Game Engine*

Awards & Honors

Megan Murphy
Outstanding Undergraduate Teaching Assistant Award

Vijay Abhijit, Allister Bernard, Jaidev Patwardhan
Outstanding Graduate Teaching Assistant Award

Sooraj Bhat, Till Brenner, Emma Buneci, Preston Dunlap, Saleem Hussain, Seth Weiner
Outstanding Staff in an Undergraduate Class

Lipyew Lim, Sara Sprenkle
Outstanding Service to the Department Award

Cecilia Magda Procopiuc
Outstanding Ph.D. Dissertation
*Geometric Techniques for Clustering: Theory and Practice.*

Xiaobo Fan
Outstanding Ph.D. Preliminary Exam
*Power Aware Memory System.*

Bryan Holland-Minkley
Outstanding Second Year Research Project
*Cache-Oblivious Priority-Queue and Graph Algorithm Applications.*
Ronald Doyle  

Martin Gilbert  

Bo Guo  
Advisor: John Reif, *Sequence Design for DNA Databases and DNA Tiling Self-Assemblies.*

Brian Hanczaryk  

Richard Kisley  

Jaidev Patwardhan  

**Presentation of Master’s Degrees**

Ronald Doyle  

Martin Gilbert  

Bo Guo  
Advisor: John Reif, *Sequence Design for DNA Databases and DNA Tiling Self-Assemblies.*

Brian Hanczaryk  

Richard Kisley  

Jaidev Patwardhan  

**Presentation of Ph.D. Degrees**

Geoff Cohen  

Apostol Natsev  

Paul Pauca  

Cecilia Magda Procopiuc  

Srikant Srinivasan  

Chia-Lin Yang  

Steven R. Meyers  

Shannon Pollard  

Stacy President  
Advisor: Alan Biermann, *Voice Interaction with an Automated Commander’s Assistant.*

Nadia Rehman  
Advisor: Alvin Vahdat, *A Comparative Analysis of Napster, Gnutella and Freenet in GUTS.*

Laura Toma  
Advisor: Lars Arge, *External Memory Graph Algorithms and Applications.*

Rajiv Wickremesinghe  

**Undergraduate Second Majors**

James R. Adleman  
Benjamin T. Allen  
Emily T. Amanatullah  
Amin Aminfar  
Shehryar Ansari  
Alan M. Billharz  
Francesco N. Caruso  
Wan C. Chen  
George Z. Cheng  
Jer-Yee J. Chung  
John J. Clyde  
Minh H. Dang  
Jason E. Donald  
John A.T. Fath  
Lina J. Fenequito  
Joseph O. Filani  
Daniel S. Gelber  
Jeremy C. Harris  
Brian C. Hill  
Alexander B. Huffman  
Ugochukwu A. Ike  
Meera P. Kakad  
Jin S. Kim  
Greg K. Kodama  
Kevin D. Lacker  
Gwenaelle C. Le Berre  
Peter B. Mack  
Paul V. Macwilliams  
Andrew J. Mahen  
Srinivasan  

Chia-Lin Yang  

Steven R. Meyers  
Michael V. Nehme  
Mark A. Ozaki  
Amil A. Patel  
Richard D. Petillo  
Stacie H. Rabinowitz  
Kyle M. Richardson  
Micah A. Rowland  
John E. Royall  
William B. Searle  
Denise A. Sharma  
Vipul K. Sharma  
Scott W. Smith  
Stephen T. Thompson  
Jonathan S. Torrens  
Tomoharu Uchiyama  
Benjamin Y. Wang  
Taowei D. Wang  
Bryan A. Williams  
Mohammad Y. Yakooob  
Sean J. Young  

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Gwenaelle C. Le Berre  
Peter B. Mack  
Paul V. Macwilliams  
Andrew J. Mahen  
Ryan T. McCarthy  
Bradley J. McMinn  
Radhika V. Mehta  
Mark M. Melnyk  

Shannon Pollard  

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Laura Toma  
Advisor: Lars Arge, *External Memory Graph Algorithms and Applications.*

Rajiv Wickremesinghe  
2002
Mithuna Thottethodi accepted a position as an Assistant Professor in the ECE department of Purdue University. This is the ninth ranked ECE graduate program and the fifth ranked undergraduate engineering department.

1999
Anne Marie Fred presently works for IBM in RTP. She has co-authored two articles to be published in the WebSphere Developer Technical Journal this summer. She is also going back to school this fall, part-time, for her Master’s degree in Computer Science.

1998
Nathan Bronson holds the title of one of the best programmers in the country. He placed third in the TopCoder programming contest in November 2001. Currently running his own business, Bronson has an extra $25,000 to invest in the company.

1996
Jackie Leyland went to work as a Business Analyst for Capital One Financial Corporation. After being promoted to Business Manager she took a year off to travel places such as Europe, South Africa and Australia. Recently, Jackie began a new job as Director of Development at the Cato Institute.

1995
Vijay Srinivasan, currently working in sunny California for Cosine Communications, is a vendor of infrastructure equipment for Internet service providers. He is also the Vice President of Network Technology and manages a team of over 75 engineers.

1992
Eric Johnson is working for Citigroup Investments in Hartford, CT. He is anxiously awaiting the birth of his second child in September.

1991
Rick LaRowe is the Director of Solutions Engineering for Baltimore Technologies, based in Dublin, Ireland. He is married to Tracy LaRowe and has three children: Lisa, Timothy and Brian.

Luis Suarez is a Principal with a southern Florida computer forensics firm specializing in civil litigation support and corporate investigations.

1987
Michael French recently became a partner in the Atlanta office of Duane Morris, LLP, a national law firm. Mr. French’s law practice focuses on computer law and intellectual property issues.

1984
Kevin Mahaffey spent eight years working for Hewlett-Packard Co. as an information technology specialist/manager. He has fulfilled his childhood dream and currently flies the Boeing 737-800 for Delta Airlines as a co-pilot.