

RAM Bytes

Grit's Bits—Message from the Chair



In this inaugural edition of RAM Bytes and the issues that follow, you will be able to glimpse the state of Computer Science at Colorado State: the faculty, the research, the students, and our plans for the future.

The Department welcomed four new faculty members in fall 2001, and another this fall, plus an instructor in spring 2002 (they are introduced later in this issue). This brings the number of tenure-track faculty to 16, plus 4 non-tenure track faculty.

After five years of explosive growth in which the number of undergraduate majors doubled from 340 to over 700, the bust of the dot-com bubble has kept these numbers flat during the past year. The number of MS graduates also doubled during this time, and we have had an increase in the number of graduate

applications and graduate enrollment.

Last fall the Department began offering an online Master's program. This year the entire schedule of the courses will be available. The program has been well received and has as many students as we can handle.

I became interim chair one year ago. The Department is continuing to search for a permanent chair, and we invite you to recommend potential candidates for this position. The position description can be viewed at <http://www.cs.colostate.edu/chair-desc.html>.

You may stay informed about the Department by visiting the Department's web site: <http://www.cs.colostate.edu>

We always welcome suggestions on ways that we can improve.

Dale Grit, Interim Chair

Contents of this issue:

Grit's Bits—Message from the Chair	1	Recent Research Awards	5
Funded Graduate Students	2	Congratulations!	6
BMAC Seminar Series	2	CSU ACM Club	6
New Courses	2	Upcoming Department Events	7
Faculty Research Spotlight	3	Industrial Advisory Board	7
New Computer Science Faculty	4	Attention CS Alumni	8
		CS Department Donations	8
		Upcoming <i>RAM Bytes</i>	8

Funded Graduate Students

The Department of Computer Science is fortunate to hire students as course instructors, lab operators, and research/systems/teaching assistants. These student employees are vital to the success of the depart-

ment and its mission. During the Fall Semester 2002 the department has 25 student hourly employees, 5 student instructors, 8 research assistants, 5 systems assistants and 26 teaching assistants.

BMAC Seminar Series

The Department of Computer Science of Colorado State University, in cooperation with ISTeC (Information Science and Technology Center), offers the BMAC seminar series as a service to all who are interested in computer science. BMAC stands for Barney's Monday Afternoon Club which was the name of our first seminar series started by Barney Marschner, a past chair of the Department of Computer Science. The current BMAC schedule can be found at <http://www.cs.colostate.edu/~bohm/bmac/>. Recently invited speakers include the following:

- June Medford, Department of Biology, Colorado State University, *In vivo imaging of biological samples: application of computer vision to biology and genomics*
- Amer Diwan, University of Colorado, Boulder, *On the Accuracy of Garbage Collection*
- Michael O'Boyle, University of Edinburgh, UK, currently visiting Stanford University, *Iterative Compilation in a Non-Linear Optimisation Space*
- Ravi Mukkamala, Department of Computer Science, Old Dominion University, *Novel Approaches to Certificate Management in PKI*
- Satinder Singh Baveja, *Indirect Reinforcement Learning: An Analysis of the Exploitation-Exploration Tradeoff and an Application to Human-Computer Interaction*
- Christopher Hundhausen, University of Hawaii, *Low Fidelity Algorithm Visualization*
- Joao Cangussu, Purdue University, *A State Variable Approach for Feedback Software Process Control*
- Mohsen Guizani, University of West Florida, *Optical High-Speed Networking*
- Behrooz Shirazi, The University of Texas at Arlington, *Pervasive Information Communities Organization (PICO)*
- Rex Page, The University of Oklahoma, *Bug Rid-dance: hardcore software engineering*
- Ross McConnell, University of Colorado at Denver, *Algorithms for Computational Biology and Data Mining*
- Grady Booch, Chief Scientist, Rational Software Corporation, *Software Archaeology*
- Indrakshi Ray, Computer Science Department, Colorado State University, *A Cryptographic Solution to Implement Access Control in a Hierarchy and More*
- Jack Dongarra, University of Tennessee, *Three Tools to Help with Cluster and Grid Computing: ATLAS, PAPI and Netsolve and An Overview and Trends in High Performance Computing*
- Rajkumar Buyya, Monash University, Melbourne, Australia. *Economics Paradigm for Resource Management and Scheduling in Peer-to-Peer and Grid Computing*

New Courses

CS581: Database Management Systems. CS581 is a new course for fall, 2002. It is designed and taught by Dr. Indrakshi Ray, iray@cs.colostate.edu. The objective of the course is to understand the theoretical underpinnings as well as the implementation techniques of the different components of a database system. The textbook used is *Concurrency Control and Recovery in Database Systems*, by P.A. Bern-

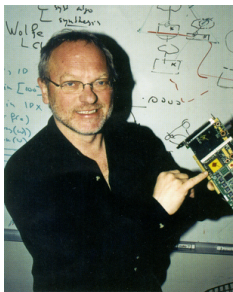
stein, V. Hadzilacos, and N. Goodman, published by Addison-Wesley, 1987. Topics include serializability theory, concurrency control, centralized recovery, distributed database design, distributed concurrency control, distributed recovery, replicated databases, and multidatabases. The pre-requisite for this course is completion of CS430.

CS517: Software Specification & Design. CS517 is a new course first taught in spring, 2001 by Dr. Sudipto Ghosh ghosh@cs.colostate.edu. In spring, 2002, it was taught by Dr. Robert France, france@cs.colostate.edu. The course will focus on advanced software modeling and specification techniques. Topics include advanced Object-Oriented modeling with the Unified Modeling Language (ML), formal specification techniques (using

B), software architectures, design patterns, software refactoring and the application of modeling techniques to component-based software development. Basic knowledge of the UML is assumed. The textbooks used are *Software Architecture in Practice* by L. Bass, P. Clements, and R. Kazman and *UML Components: A Simple Process for Specifying Component-Based Software* by J. Chessman and J. Daniels. The prerequisite for this course is completion of CS414.

Faculty Research Spotlight

Brad Bohlander



Colorado State University computer scientists are changing the future of computing by creating an entirely new class of adaptable computer systems capable of processing large files and complex data sets at blazing speeds—up to 600 times faster than the quickest Pentium chip.

The unique high-speed, low-power computers already are being used to improve defense satellite recognition systems, enhance military night vision software, and improve the speed of transmitting images over the Internet.

The key to this new technology, developed by Colorado State computer science researchers **Wim Bohm**, **Ross Beveridge** and **Bruce Draper**, is a powerful chip called a Field Programmable Gate Array, or FPGA. The FPGAs greatly increase a computer's speed by reconfiguring the hardware circuits to directly match the needs of a particular software program. The system essentially creates programmable hardware by allowing users to repeatedly download new programs directly onto a computer's circuits.

"We are developing a very different paradigm for computing that has the potential to dramatically change the industry within the next 20 years," Beveridge said.

These cutting-edge computer systems have piqued the interest of the U.S. military. For the past four years, the Defense Advanced Research Projects Agency funded the development of this innovative technology. Two projects have been completed for the military that are now being adapted by government labs for defense purposes.

The first is a ground-based target recognition system with night vision that automatically detects ob-

jects, such as enemy tanks, and displays results on a screen inside a U.S. military vehicle, describing both what the object is and its position. The detection process works about 600 times faster than the most powerful Pentium chip.

"If you are in a military operation in the middle of the night trying to determine if an enemy tank is in the vicinity, you don't want the answer in an hour or even a minute, you want it right now," said Draper. "A system with an 800 MHz Pentium chip displays the image in 65 seconds; our system takes less than one second."

The second project is an automatic target recognition pre-screener program that allows Air Force satellites to scan images of large land masses and quickly recognize vehicles and facilities for further military observation. The new system recognizes objects about 40 times faster than previous systems. Deployed on a satellite, it can also be upgraded from Earth.

A commercial application currently being supported by Honeywell focuses on improving wavelet technology to compress large images. Wavelets are a primary tool used to condense JPEG images for transfer over the internet. With this new technology, researchers are making this data compression 10 to 100 times faster and cheaper than the chips currently being used.

The Colorado State research team is now looking into other potential commercial applications, including incorporating the technology into PCs, resulting in desktop machines that would be virtual supercomputers. Other possible applications involve using this technology to improve electronics such as digital televisions.

"There are currently several digital television formats that are consistently being changed and upgraded," said Bohm. "By using FPGAs, any updates or changes in formats could be downloaded directly

to the TV. Consumers could easily obtain the latest technology without having to buy new electronics."

The Colorado State computer science team created this new technology by building a compiler that maps algorithms directly onto computer circuits that can then be downloaded onto an FPGA. The ability to download a program directly into hardware circuits, coupled with advances in the digital chips, re-

sults in FPGA circuits that can handle many simultaneous processes hundreds of times faster than on a normal computer.

For completed information about this technology and its applications, including in-depth overviews, diagrams and technical information, visit the web at <http://www.cs.colostate.edu/cameron/index.html>

New Computer Science Faculty



The department welcomes its newest member, **Ross McConnell**, who has started as assistant professor this fall. Before coming to CSU Ross worked at the University of Colorado in Denver, Willamette University, and Amherst College. He got his doctorate at the University of Colorado in Boulder. Before getting his doctorate, he held a

number of industrial positions. Ross's research interests are in graph theory and algorithms. His recent work has been on problems that arise in genomics and scheduling theory. He will teach his first classes, CS 520 (Algorithms) and CS 166 (Discrete Structures) in the spring. Starting this fall, he is available to work with grad students. More information about his research interests is available at his home page at <http://www.cs.colostate.edu/~rmm>.



Sudipto Ghosh received the Bachelor of Technology degree in Computer Science and Engineering from the Indian Institute of Technology, Kanpur, India, in 1993. He received the Master of Science degree in Computer Science from Iowa State University in 1995 and the Doctor of Philosophy degree from Purdue University in 2000.

He is currently an Assistant Professor in the Computer Science Department at Colorado State University, Fort Collins, Colorado. His teaching and research interests include modeling, designing and testing of object oriented software, distributed object systems and component-based software development. He is a member of the Association of Computing Machinery and the IEEE Computer Society. More information is available at his home page at <http://www.cs.colostate.edu/~ghosh>.



Indrajit Ray joined the faculty of Computer Science at Colorado State University in August 2001. From fall 1997 to winter 2001 he worked as a tenure track faculty in the Computer and Information Science department at the University of Michigan-Dearborn.

He teaches courses in the areas of computer security, computer networks and database systems. He received his doctoral degree in Information Technology from George Mason University in Fairfax, VA, in summer 1997. Indrajit's main research interests are in the areas of computer and network security. His dissertation was in the area of multilevel secure transaction processing. Some of his recent works involve developing secure transaction processing systems and designing secure and reliable fair-exchange protocols, anonymous protocols, and voting protocols. He is currently working on a framework for survivable transactions. The goal of this work is to propose a transaction model in which transactions can defend themselves against malicious attacks. A second project investigates pro-active approaches to network defense. The idea is to propose a system that is able to predict malicious attacks before they happen and take appropriate measures so as to survive such attacks and continue to provide essential network services. More information about Dr. Indrajit Ray is available at his home page at <http://www.cs.colostate.edu/~indrajit>.



Indrakshi Raya graduated from George Mason University in summer 1997. Her dissertation focused on how formal methods can be used to solve problems in the area of multilevel secure databases, heterogeneous databases, and databases having long-duration transactions.

Before joining Colorado State University, she was an Assistant Professor at the University of Michigan - Dearborn where she taught courses in Database Security, Software Engineering, and Formal Methods in Software Engineering. Her research during this period was on the development and formal verification of secure internet protocols. She joined Colorado State University in fall 2001 as an Assistant Professor. She teaches courses on Database Systems and Database Security. Her research spans two areas: Data and Application Security and Software Specification Languages. Currently she is working on how to design secure software systems. She is also looking into some problems associated with information security policies. More information about Dr. Indrakshi Ray is available at her home page at <http://www.cs.colostate.edu/~iray>.



Roger Alexander holds a Ph.D. in Information Technology, MS in Software Engineering, and a BS in Computer Science. Prior to joining academia, he worked in the software industry for 23 years. His research interests include code-based testing, static and dynamic program analysis,

reverse engineering, computer security, and information retrieval over the WWW. Dr. Alexander teaches courses in object-oriented design, compiler construc-

tion, and other software engineering related topics. More information about Dr. Alexander is available at his home page at <http://www.cs.colostate.edu/~rta>.



Sanjay Rajopadhye came to CSU in fall 2001. He was previously in France at IRISA (a computer science research lab affiliated with the University of Rennes), where he headed the COSI group working on silicon compilation. Before that, he was on the faculty of Oregon State University and the University of Oregon, which he joined after his

PhD from the University of Utah in 1986. He holds a B.Tech from the Indian Institute of Technology, Kharagpur. Dr. Rajopadhye's general research interests cover architecture, VLSI, parallelism, compilation and algorithms. He has contributed to the development of the polyhedral model, which provides a semantic and quantitative model for an important class of compute-intensive programs. In this model it is possible to reason about correctness and optimality of program transformations for a number of applications. This can be done for a variety of target architectures, including processors with a deep memory hierarchy, multiprocessors and special purpose VLSI chips. Dr. Rajopadhye teaching involves most of the core courses in architecture, algorithms, parallel computing and VLSI. He is involved in developing a course sequence in reconfigurable computing, where "reprogrammable chips" may be used to directly compile programs to silicon. More information about Dr. Rajopadhye is available at his home page at <http://www.cs.colostate.edu/~svr>.

Non-tenure track faculty will be profiled in the January, 2003 edition of *RAM Bytes*.

Recent Research Awards

Chuck Anderson and Michael Kirby (Math Department) were awarded a grant by the National Science Foundation (NSF) for their proposal entitled *Geometric Pattern Analysis and Mental Task Design for a Brain-Computer Interface*. The total of the project is \$699,308. The project will support two graduate research assistants for 4 years.

Wim Bohm was awarded a grant by TRW for his proposal entitled *Processing Modernization IRAD*. The total of the project is \$25,000. The project will support one and a half graduate research assistants for 1

semester.

Robert France, Sudipto Ghosh and Anneliese Andrews were awarded a grant by NSF for their proposal entitled *Testing Unified Modeling Language (UML) Designs*. The total of the project is \$300,000. One-third of the overall contract will be subcontracted to Washington State University under the direction of Anneliese Andrews.

Adele Howe was awarded a grant by NSF for her proposal entitled *ITR: Modeling Domain Independent Planning to Advance Application*. The total of

the project is \$205,970. The project will support one

graduate research assistant for 3 years.

Congratulations!

The department congratulates faculty and students on their recent accomplishments.

The *Thomas J. Heidenfelder Scholarship* for service and academic achievement in Computer Science has been awarded to **Manfred Georg** and **Ian Rousom**.

The *Patricia Mohilner Memorial Scholarship* for academic excellence in Computer Science has been awarded to **Travis R. King**.

The *Anita Read Graduate Award* for dedication to education and excellence in teaching has been awarded to **Monica Chawathe**.

Dr. James Bieman was promoted to Full Professor in the Department of Computer Science effective July 1, 2002.

Dr. Bruce A. Draper was granted tenure and pro-

moted to Associate Professor in the Department of Computer Science effective July 1, 2001.

Dr. Robert France was granted tenure as an Associate Professor in the Department of Computer Science effective July 1, 2000.

Dr. Sanjay Rajopadhye was granted tenure as an Associate Professor in the Department of Computer Science effective July 1, 2002.

Dr. Darrell Whitley was granted sabbatical leave for Fall Semester 2002. During his sabbatical he will continue his research collaborations at The University of Birmingham in England and will be teaching a course on Machine Learning at the National Laboratory for Scientific Computing in Petropolis, Brazil.

CSU ACM Club

Aishwarya Shukla, ACM Club President

The ACM (founded 1947) is an international scientific and educational organization dedicated to advancing the art, science, engineering, and application of information technology, serving both professional and public interests by fostering the open interchange of information and by promoting the highest professional and ethical standards.

The Colorado State University ACM Club was founded 30 years later in 1977. Since then the ACM has been a very active student organization on and off campus organizing various events in collaboration with the IT Industry and researchers and academicians in the field of computing science.

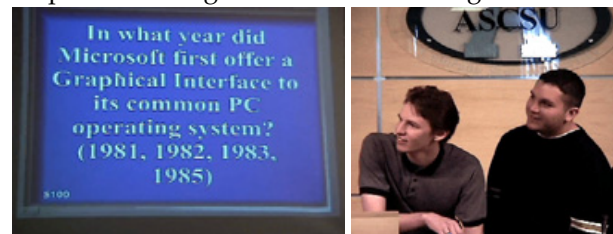
The following is a summary of events the ACM club has organized in the recent past.

Now you'll know: Faculty-Student Interaction (October, 2002) The event was organized so students could have an open question—answer session with the faculty and learn more about the CS department and the programs it has to offer. It also served as a feedback forum for the department since the faculty got to know more about student concerns and issues. The event's faculty panel comprised of Dr. Dale Grit, Dr. Wim Bohm, Dr. Ross Beveridge (ACM Faculty

Advisor), Mr. James Peterson. The turnout for the event exceeded our expectations! The student participants comprised of 2/3 undergraduates and 1/3 graduate students. In all, the event was a great success.

ACM-CIS club Career Counseling Session (September, 2002) This was the ACM club's kick off event. An enlightening career counseling session for job and internship seekers, where Judy Brobst (Career Counselor, College of Natural Sciences) and Bill Shuster (Career Counselor, College of Business) shared important tips on "Honing in on a Job".

"Win Bill Gates' Money" Game Show (April, 2002) A Jeopardy-like format game show where technical and fun computer science related questions were asked. The event was sponsored by Microsoft besides local computing machinery vendors. There were nine teams of three students each which participated in the game show. It was a great success.



IBM Cookie stacking contest (February, 2002) A fun event sponsored by IBM. The person with the highest tower of cookies won an IBM WorkPad.

The ACM has many more exciting events underway. On November 1st the ACM is organizing SUN and IBM visits in collaborations with the Career Center, Department of Electrical and Computer Engineering and the Department of Computer Information Systems. This is the first year the ACM club

has entered in collaboration with other organizations and departments at such a large scale. In the past the ACM has had joint events with the Career Center and the College of Business.

The ACM club meets every other Wednesdays at 5pm. The venue for regular meetings is the CS conference room 310B USC.

For more information, visit the ACM club's homepage at <http://www.colostate.edu/~acm>

Upcoming Department Events

- **October 11, 2002.** Department of Computer Science Industrial Advisory Board Meeting.
- **November 4, 2002.** Dr. Eugene H. Spafford, Professor of Computer Science at Purdue University will present two talks. His first talk *Myths, Fads, and False Economies: How NOT to Get Secure Systems* will be presented in the morning and is co-sponsored by the Information Science and Technology Center (ISTeC) at Colorado State University. Dr. Spafford will present the Department of Computer Science BMAC Distinguished Lecture in the afternoon. His technical lecture is *ESP and Poly2: Challenging the Conven-*

tional Wisdom. Dr. Spafford's biographical sketch may be viewed at <http://www.cerias.purdue.edu/homes/spaf/>. To view updated information on Dr. Spafford's talks and the department's seminar series please go to <http://www.cs.colostate.edu/~bohmbmac/>.

- **December 20, 2002.** Colorado State University Graduate School Commencement, Moby Arena at 7:30 p.m.
- **December 21, 2002.** College of Natural Sciences Undergraduate Commencement, Moby Arena at 7:00 p.m.

Industrial Advisory Board

Dale Grit

In February 1999, the Computer Science Department initiated an Industrial Advisory Board to facilitate meaningful collaboration between the Department and industry in the areas of research, education, recruiting, and development. The Board meets once or twice a year to discuss departmental research, curriculum, and other topics of mutual interest. Currently the Board includes representatives from the following:

- Advanced Energy Industries, Dr. Ralph H. Castain
- Boise Cascade and Private Consultant, Dr. Thomas J. Heidenfelder
- Colorado Software and Internet Association, Cathy Ewing
- Dako-Cytomation, Dr. George Malachowski
- Dolphin Technology Inc., Ms. Pamela D. Miller, CISSP
- Electronic Data Service, Dr. Charles (Chuck) Shellhouse
- Hewlett-Packard Company, Dr. Denny Georg
- IBM, Dr. Gerri Peper and Mr. Lacey Bostick
- Intel, Dr. Ketan Paranjape
- John Deere, Dr. Roger Burkhart
- KinetX, Dr. Jonathan Murray
- Lockheed Martin Astronautics, Dr. Robert (Bob) L. Knickerbocker
- LSI Logic, Dr. David Jones
- The MITRE Corporation, Mr. Steve Gosnell
- OnRamp Technologies, Dr. George J. Proeller, CISSP
- ProtoTest, Dr. Pete Dignan
- Qualcomm Incorporated, Dr. Sumit Sur
- Qwest, Mr. Ross Rutledge
- Rational Software Corp., Mr. Grady Booch

- Seymour R. Cray Corporation/SRC Corporation,
Dr. Jeffrey Hammes
- Sun Microsystems, Mr. Terry J. Erdle

- TRW, Dr. Alexander "Robbie" Robertson
- Xilinx Laboratories, Dr. Philip James-Roxby

Attention CS Alumni

We would love to hear from you about what you are doing now. Send an e-mail message to alumni@cs.colostate.edu or regular mail to Sharon Van Gorder, Department of Computer Science, Col-

orado State University, Fort Collins, CO 80523-1873. Alumni may request to be on the mailing list for *RAM Bytes* and can send their request to alumni@cs.colostate.edu.

CS Department Donations

Please remember the department when you are making donations to Colorado State University. You can specify that your donations come to the Department of Computer Science. If you are interested in making a donation directly to our department, please send

all correspondence to Dr. Dale Grit, Department of Computer Science, Colorado State University, Fort Collins, CO 80523-1873.

Thank you for your continued support!

Upcoming *RAM Bytes*

Suggestions for future editions of *RAM Bytes* are welcome. The next edition is planned for January, 2003, and will include at least the following topics:

- Computer Science Department Non-Tenure Track Faculty Profile
- Upsilon Pi Epsilon Chapter at Colorado State Uni-

- versity
- Recent Computer Science graduates and what they are doing now
- Computer Science Masters and Dissertation Library
- Update on Department Chair Search

Editors:

Chuck Anderson & Sharon Van Gorder
Department of Computer Science
Colorado State University
Fort Collins, CO 80523-1873

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ting *R News*, which can be found on-line at <http://cran.r-project.org/doc/Rnews>.

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