

# RAM BYTES

FALL 2003

VOLUME 2

**INSIDE THIS ISSUE:**

- **Message from the Chair**
- **Faculty Research Spotlight**
- **New Research Awards**
- **Ph.D. Graduates**
- **Masters Degrees Awarded**
- **UPE Inductees**

Two Distinguished Lectures presented by ISTeC and Computer Science

**Dr. David Haussler**

Presidential Chair of Computer Science and Director of the Center for Biomolecular Science and Engineering at the University of California, Santa Cruz

*The UCSC Human Genome Browser*

and

*Comparing the Human, Mouse and Rat Genomes*

November 14, 2003



*Knowledge to Go Places*

## Message from the Department Chair



**Darrell Whitley**

I have only been Chair of Computer Science at CSU for a few months, but I have become keenly aware that the job mainly involves taking advantage of the many opportunities available to the department.

If you graduated from CSU more than 10 years ago, the department has changed dramatically. Both graduate and undergraduate enrollment has grown, and we now annually produce approximately 100 B.S. degrees, 35 M.S. degrees, and 3 doctorates. New research awards in 2002 totaled 2.5 million dollars — 10 times the funding level in 1990. And yet, with the economic slowdown, our base budget from the state and university has decreased 10 percent, so the department must do more with less.

We plan to add three new tenure track faculty over the next three years. These new positions will help us to reduce undergraduate class size and offer a wider range of classes. New faculty will also help us to achieve greater critical mass in our research efforts. We are also expanding our collaboration with industrial partners.

Computer Science will be moving to the Oval in four to five years. This will also be an opportunity for us to think about our new space and our resource needs and create a new home for CS of which we can be proud.

We have established two new fellowships: one in general Computer Science, and the other in Artificial Intelligence and Evolutionary Computation. These fellowships will be competitively awarded and will provide both summer support for graduate students and aid our graduate recruiting efforts.

Finally, I want to thank the faculty and staff for their support and encouragement. The faculty in Computer Science are an amazingly collegial group of people, as well as impressive, productive teachers and researchers. As far as I am concerned, that makes CSU one of the best places to work.

### BIOGRAPHICAL SKETCH: Dr. Darrell Whitley

Dr. Whitley received his Ph.D. in Anthropology in 1985 and Masters in Computer Science in 1986, both from Southern Illinois University. He joined the Computer Science Department at CSU in 1986 and began working in the area of Genetic Algorithms and Evolutionary Computation. In the late 1980's, he and his students pioneered the application of genetic algorithms to real-world scheduling problems. He developed the first systems to combine genetic and neural networks, particularly for control applications. In the 1990's, he played a key role in developing theoretical models of genetic algorithms and analyzing representations used by evolutionary algorithms.

In 1997, *Business Week* ranked CSU one of the top research programs in the world in biologically inspired computation. In 2003, Dr. Whitley was inducted as a senior fellow of the International Society for Genetic and Evolutionary Computation. Dr. Whitley has served as Chair of the Governing Board of the International Society for Genetic Algorithms and as Editor-in-Chief of the MIT Press journal *Evolutionary Computation*.

**Department Faculty**

- Roger T. Alexander, Ph.D.
- Charles Anderson, Ph.D.
- J. Ross Beveridge Ph.D.
- James M. Bieman, Ph.D.
- Elizabeth Boese, M.S.
- A. P. Willem Bohm, Ph.D.
- Bruce A. Draper, Ph.D.
- Robert B. France, Ph.D.
- Sudipto Ghosh, Ph.D.
- Dale H. Grit, Ph.D.
- Van Howbert, M.S.
- Adele E. Howe, Ph.D.
- Anura P. Jayasumana, Ph.D.
- Yashwant K. Malaiya, Ph.D.
- Ross M. McConnell, Ph.D.
- Sanjay Rajopadhye, Ph.D.
- Indrajit Ray, Ph.D.
- Indrakshi Ray, Ph.D.
- Carolyn Schauble, Ph.D.
- Sandy Schleiffers, Ph.D.
- H. J. Siegel, Ph.D.
- L. Darrell Whitley, Ph.D., Chair

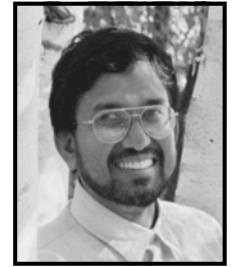
**DID YOU KNOW?**

- 👉 We have more than 2.5 million dollars of new funding in 2003.
- 👉 Enrollment in our Master of Computer Science online degree program has grown over 500% in the last year.
- 👉 Computer Science is in the top 5 in both undergraduate and graduate enrollments at CSU.
- 👉 We are one of only three schools in the nation with less than 20 faculty that are also in the top 100 in NSF funding.

**Faculty Research Spotlight**  
**Drs. Indrajit and Indrakshi Ray**  
**Computer and Information Systems Security**



**Indrakshi Ray**



**Indrajit Ray**

Tired of battling viruses, worms, and Trojan Horses in your software? Imagine the disastrous results if a malicious virus hijacks the flight control system of a commercial plane approaching a major airport.

That's one of the concerns of Drs. Indrajit and Indrakshi Ray, who came to CSU in 2001 from the University of Michigan-Dearborn. Together, they spearhead the Computer Science Department's research in computer and information systems security. Their focuses include: trust models, designing secure software, designing secure and survivable networks, security policy specification and validation, and secure and survivable transaction processing.

All security related decisions rely in some way on fundamental assumptions about trust. The major goal of researching trust models is to formalize the notion of trust as relevant to computer security. Unfortunately, we do not have a precise definition of what trust is, how it can be quantified, or how it can be composed. Is trust a binary variable? Does trust have only yes/no or 0/1 values? Many would like to think so, but it leads to inconsistencies. For example, assume a piece of information relevant to national security is obtained from a "trusted" source and is considered to be fully trusted (value 1). Another relevant piece is obtained from an "untrusted" source and is considered non-trusted (value 0). If both these pieces of information are combined and the result used for national security, how much should that information be trusted -- completely, not at all, or somewhere in between? The Rays are looking for answers to those questions.

Designing secure software involves addressing a major problem all computer users regularly face: the havoc created by viruses, worms, and Trojan Horses in software. What would happen if that software controlled critical infrastructure? According to Indrakshi Ray, "We feel it is crucial to security for software designers and programmers to ensure their software does exactly what it is supposed to do and that there are no hidden bugs, viruses, or worms." To that end, they are developing tools to help designers generate more secure software. They are also looking at a very special type of software paradigm called transactions. Many applications, such as financial applications, are modeled as transactions so that they retain certain desirable properties. However, this software model has added security concerns. Consider a transaction that is controlling the life support system of a critically ill person: the transaction needs to get information about the latest blood test results of the patient from a remote host, but unknown to the transaction, the remote host has been compromised by a cyber terrorist. This research explores how to protect the transaction from the hostile host and how it can provide its functions in the face of hostile environments.

Indrajit Ray's research on computer network security has three goals: prevent, detect, and survive. A major threat to computer networks is denial of service attacks, for example, if a 911 network is flooded with spurious mal-intent messages. A cyber terrorist could effectively prevent a critical infrastructure network from providing services. The first goal is to prevent the attack, but a determined, sophisticated cyber terrorist with enough resources could still break our cyber defenses. For those cases, Dr. Ray is creating tools that will converge on the attacker, isolate and confine the attack, and prevent it from spreading. At the same time, the tools will ensure the survival of the affected network and the continuation of critical services.

Indrakshi Ray's project on security policies involves developing a mechanism to ensure the exact security policies are in place to protect systems. By far, security policy plays the most important role in cyber defense. Policies specify what resources must be protected and from whom, and incorrect ones can cause security breaches. Currently, most policies are specified in an ad-hoc manner. This research investigates how to specify correct policies, validate them, analyze their interactions, and enforce them for real-world applications.

The Rays' timely, cutting-edge research is supported by several new grants (see page 3 of the newsletter) and funding from the National Science Foundation, the U.S. Air Force, and the Federal Aviation Administration.

## CS Faculty Win Research Awards

**Dr. Chuck Anderson** and Dr. Michael Kirby (Math), *REU "Research Experiences for Undergraduates."* National Science Foundation (NSF).

**Dr. Chuck Anderson**, Dr. Douglas Hittle (Mechanical Engineering), and Dr. Peter Young (Electrical Engineering). *Robust Learning Controls for Buildings Energy Systems.* National Science Foundation (NSF).

**Dr. Darrell Whitley** and **Dr. Adele Howe.** *Advancing Air Force Scheduling Through Modeling Problem Topologies.* Department of Defense-U.S. Air Force (DOD-USAF).

**Dr. Sanjay Rajopadhye** and **Dr. Wim Bohm.** *High Level Programming of High Performance Embedded Computing Systems (HiPHiPECS).* National Science Foundation (NSF).

**Dr. Indrajit Ray.** *Toward a Proactive Approach to Defense Against and Recovery from Cyber Attacks.* State University of New York (SUNY).

**Dr. Indrajit Ray** and **Dr. Indrakshi Ray.** *A Framework for Secure and Survivable Transaction Processing.* National Science Foundation (NSF).

**Dr. Indrajit Ray** and **Dr. Indrakshi Ray.** *A Model of Trust for Developing Trustworthy Systems from Untrustworthy Actors.* Air Force Research Laboratory (AFRL).

## Recent Ph.D. Graduates

**Dr. Kyungim Baek**, Fall 2002. *An Algorithmic Implementation of Expert Object Recognition in Ventral Visual Pathway.* Dr. Baek is doing post-doctoral work at the Department of Bioengineering at Columbia University.

**Dr. Emanuel S. Grant**, Fall 2002. *Defining Domain-Specific Object-Oriented Modeling Languages as UML Profiles.* Dr. Grant is an Assistant Professor in the Department of Computer Science at the University of North Dakota.

**Dr. Stewart Crawford-Hines**, Summer 2003. *Machine Learned Boundary Definitions for an Expert's Tracing Assistant in Image Processing.* Dr. Crawford-Hines is developing new avenues in biomedical visualizations at Visible Productions, the company where he worked to commercialize his research ideas.

**Dr. Jean-Paul Watson**, Fall 2003. *Empirical Modeling and Analysis of Local Search Algorithms for the Job-Shop Scheduling Problem.* Dr. Watson is a researcher in the Discrete Algorithms and Mathematics Group at Sandia National Laboratory.

## UPSILON PI EPSILON

### 2003 INDUCTEES

Hari Aiyer  
Monica Dilip Chawathe  
Gabriel J. X. Dance  
Sean A. Davis  
Deepali Deshpande  
Matther T. Despain  
Jochen Deyke  
Kelly S. Graus  
Catherine E. Jones

Carol L. Kaito  
Anthony J. Martino  
Clint C. McMahon  
Jay A. Paolucci  
Thomas S. Price  
Yedduladoddi R. Reddy  
Roger A. Robbins  
Charlie Ross  
Ian D. E. Rousom

Robert E. St. John  
Aishvarya Shukla  
David R. Sullivan  
Sonja V. Tideman  
Brian T. Trevethan  
Xiuping Wang  
Saul Weiss  
Lingzhi Yang

## Industrial Advisory Board

Agilent Technologies  
Boise Office Solutions  
Colorado Software and  
Intenet Association  
Compuware Corporation  
Dako-Cytomation  
Decisions LLC  
Electronic Data Service  
Fluke Networks  
Hewlett-Packard Company  
IBM  
Intel Corporation  
John Deere  
KinetX  
Lockheed Martin Space Systems  
LSI Logic  
The MITRE Corporation  
Northrop-Grumman  
OnRamp Technologies  
ProtoTest  
Qwest  
Rational Software Corporation  
Sun Microsystems  
Xilinx Laboratories

## Masters Degrees Awarded

### Fall 2002-Summer 2003

Tarun Banka  
Nishant Bawa  
David Scott Bolme  
Jiao Chen  
Sameer Goel  
Atul K. Gupta  
David Lee Henry  
Bixia Ji  
Somashekhhar S. Khot  
Kevin T. Muir  
Chad Edmund Schneider  
Marcio Luis Teixeira  
Sonja Victoria Tideman  
Kalyani Vunnava  
Ran Ye  
Hongjun Zhang

Computer Science Department  
Colorado State University  
1873 Campus Delivery  
Fort Collins, CO 80523-1873

Phone: 970-491-5792  
Fax: 970-491-2466  
www.cs.colostate.edu

**Editor**

Lisa Knebl

**Faculty Advisor**

Dr. Charles Anderson

*RAM Bytes* is published by the Computer Science Department, Colorado State University. All articles are copyrighted by the respective authors.

Communications regarding this publication are welcome and should be E-mailed to:

[newsletter@cs.colostate.edu](mailto:newsletter@cs.colostate.edu)

*RAM Bytes* is available online at:

<http://www.cs.colostate.edu>



*Knowledge to Go Places*

NONPROFIT  
ORGANIZATION  
U.S. POSTAGE  
**PAID**  
Fort Collins, Colorado 80523  
Permit Number 19

**ATTENTION ALUMNI**

Please take a moment to update your contact information and share your positive ideas and suggestions for the department. We appreciate your input!

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

EMAIL \_\_\_\_\_

COMMENTS: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Return this form to: Lisa Knebl  
Computer Science Department  
Colorado State University  
Fort Collins, CO 80523-1873

Or E-mail us at:  
[newsletter@cs.colostate.edu](mailto:newsletter@cs.colostate.edu)