



The

UTAH TEAPOT

Fall 2002

A QUARTERLY NEWSLETTER FOR THE ALUMNI AND FRIENDS
OF THE UNIVERSITY OF UTAH SCHOOL OF COMPUTING

In This Issue

- ☒ Warnock Endowed Chair Filled by Emil Praun
- ☒ C-SAFE Renewed, Largest Project in U of U History
- ☒ Tempest in a Teapot
- ☒ SIGGRAPH 2002
- ☒ Summer Interns Participate in Locomotion Interface Research
- ☒ 2002-2003 Evans & Sutherland Distinguished Lecture Series
- ☒ Dave Hanscom Wins COE Outstanding Teacher Award
- ☒ Research Support in 2002
- ☒ The Real-Time Ray Tracer Debuts at SIGGRAPH 2002

The teapot was one of the first free-form models used in computer graphics. Since it was created at the University of Utah (by Martin Newell) in 1975, the teapot has become a favorite computer graphics benchmark. The teapot symbolizes Utah's distinguished leadership in computer graphics.

Emil Praun Receives John E. and Marva W. Warnock Endowed Chair

Emil Praun, Ph.D. joined the School of Computing faculty in August 2002 as the first recipient of the John E. and Marva M. Warnock Presidential Endowed Chair for Faculty Innovation in Computer Science. Emil is a graduate of Princeton University, where he studied computer graphics, specializing in local surface parameterizations.

"I wanted to come to Utah to be a part of a graphics group with a long-established tradition and to work with the people here who are carrying on

continued on page 3

C-SAFE Renewed, Largest Project in U of U History

By Ann Torrence

The University of Utah's largest single research contract just got bigger, and longer. The Department of Energy has renewed the Center for the Simulation of Accidental Fires & Explosions (C-SAFE) for an additional five years, with a total funding level of \$40 million over the entire ten year period, the largest single program ever at the University of Utah.

School of Computing faculty lead one of five core efforts in the research program. The main goal of C-SAFE is to develop the capacity to perform 3-D simulations of accidental jet-fuel pool fires and the response of a high-energy device to the fire. An example of such a device would be a container filled with an HMX-based explosive (e.g., PBX 9501).

Other teams are developing complex models of explosive materials engulfed in fires, and with help from the CS team, these simulations have been created to run on the world's fastest supercomputers, made available through a partnership with the U.S. Department of Energy.

In the first five years of the program, the computer science team has developed a massively parallel computational infrastructure which manages inputs, allocates resources and provides dynamic load balancing in a mixed threads/MPI computing environment, analyzes performance, and performs data management, visualization and analysis. The infrastructure is used to integrate the multi-physics, multi-numerical codes including visualizing the underlying atomistic and MD simulations, structural analysis, fire evolution, and computational fluid dynamics.

C-SAFE involves over twenty faculty members in six academic departments at the University of Utah, as well as subcontractors at Brigham Young University, Worcester Polytechnic Institute and the University of Oregon. The center also supports twenty full-time staff and twenty graduate students.

Managing a large-scale code development project is not a traditional activity within academia, and to coordinate the efforts, C-SAFE named SoC faculty member Steve Parker (PhD '99) as Chief Software Architect. Soft-

continued on page 2



C-SAFE Renewed, Largest Project in U of U History

continued from page 1

ware developers from across the center meet weekly to discuss current status of the code, short and long-term plans for implementing new algorithms, methods or features, tutorials on how to check out, compile and run different portions of the code, and allocation of available time on ASCI computing platforms.

“As chief architect of the Uintah software, I am responsible for accommodating the often disparate needs of the C-SAFE application teams, and for coordinating the development of software into a unified, highly parallel software system. This is a very challenging, but rewarding task, requiring knowledge of the techniques employed by the various disciplines, including algorithms and numerical methods, and even portions of the science,” said Parker.

The computer science team also includes faculty members Tom Henderson, Chuck Hansen, Chris Johnson, Gary Lindstrom, and Kris Sikorski. Key staff include Utah alums J. Davison de St. Germain (MS '02), James Bigler (BS '01) and Bryan Worthen (BS '02). Kurt Zimmerman is also a senior contributor through the Scientific Computing and Imaging Institute. Wayne Witzel (BS '00), recently left the team to pursue graduate studies at the University of Maryland.

Research areas that the computer science team will pursue in the next five years include:

- Upgrading the Problem Solving Environment to an official CCA implementation. This includes the prototype of a new CCA graphical user interface (builder) and interactive user interfaces for each of the simulation components.
- Extending the Computational Framework to enable Adaptive Mesh Refinement (AMR) in simulation components and addressing dynamic load balancing issues.
- Improving Performance Analysis, to add the abil-

ity to dynamically visualize performance metrics as the simulation is running.

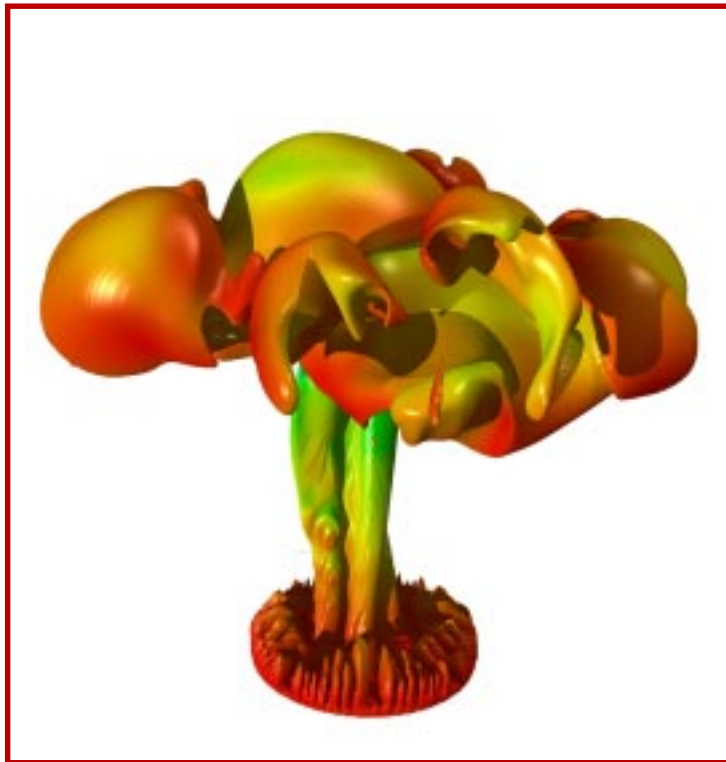
- Creating the capability for C-SAFE researchers to interactively explore the simulation results (e.g., select and view the three dimensional fire and resultant data in real-time). The research will involve adaptive visualization leveraging the AMR framework, and distributed memory visualization tools (taking advantage of clusters).

The Department of Energy has committed computing resources from Los Alamos National Laboratory, Livermore National Laboratory and Sandia National Laboratories for simulations that require thousands of processors. For code testing and research production runs of applications software, the University of Utah has provided funding for a dedicated, 256-processor Linux cluster to be housed within the SCI Institute. The Linux cluster will itself provide C-SAFE access to one of the world's top 500 supercomputers in terms of raw performance.

The University of Utah also funds experimental work of Thiokol Propulsion to provide data to help guide the simulation efforts and validate computational results. Highly instrumented explosion tests are providing insights into the chemical and engineering models, confirming simulation predictions at a very large scale.

“The C-SAFE project has allowed the School of Computing to work on important problems critical to the nation's interest while at the same time developing the burgeoning foundations of simulation science,” said Henderson. ☐☐

C-SAFE is funded by the US Department of Energy through a subcontract from Livermore National Laboratory. To learn more about this program, visit www.csafe.utah.edu.



This visualization shows data from two 300^3 scalar fields generated by the Fire Spread team. The first field, temperature, is used to create an isosurface, and the second field, velocity magnitude is used to color the isosurface (red:low, blue:high). This image was generated by James Bigler who also wrote the code that allows the coloring by another variable. Steve Parker wrote the `frft` (see page 7) and isosurface rendering code.

Emil Praun Joins Faculty

continued from page 1

that tradition. Being the first recipient of the chair is a great honor. These resources provide much appreciated support in establishing my career, support that was not matched by any other offer I received," said Praun.

John Warnock, a University of Utah alumnus, is the co-founder and chairman of the board of Adobe Systems. Marva Warnock, also a University of Utah graduate, is a designer and partner with Marsh Design, a graphic design firm in Palo Alto. The Warnocks established the chair with a gift in 1999 and active recruitment began in 2000. This non-traditional endowed chair was designed to support scholarship and creativity in the early career of outstanding young faculty members such as Praun, who will hold the chair for up to six years. It will then re-

vert to the School as a tool for recruiting another top talent in computer science.

"Emil is one of the top young researchers in computer graphics. He is an expert in the area of digital shape representations where he has done pioneering work in both 3D shape representation and in applying surface detail to 3D representations. He brings strength to our graphics program. Besides, he's a great skier!" said Chuck Hansen, Associate Director.

Praun completed his B.S. in Computer Science from CalTech in 1997, after two years of study at Politechnica University of Bucharest. While at Princeton, he was named a Microsoft Research fellow and spent two summers in Redmond, Washington. He also interned at Lucent Bell Labs in Murray Hill, New Jersey in 2000.

He is married to Delia, a physician who will be joining him from

Romania in January. He enjoys skiing, hiking and swimming. He is looking forward to his first ski season in Utah. ☐☐



Emil Praun

Meet new faculty member, Mike Kirby, in the next issue of the Teapot.

Tempest in a Teapot

Interdisciplinary Degrees

By Thomas Henderson

For the last two years, we in the School of Computing have been working hard to better understand exactly what it means for us to have become the School of Computing. Our basic premise is that we have been charged to help create and to participate in new interdisciplinary degree programs that involve computing at their core. The areas that we have in mind as possibilities include: bioinformatics, software engineering, scientific computing, computer graphics and visualization, and our idea is to work with other departments to create degree programs in such areas.

However, after quite a bit of deliberation and discussion, we have determined that the best thing to do is to create a second degree program in the School of Computing, namely, an MS and a PhD in Computing, and to create tracks in the areas described above; this

will be done in conjunction with the other appropriate departments on campus.

This approach has several advantages: (1) it signals our outreach and commitment to meet the demand for incorporating computing academically into the research and instructional fabric of the university, (2) it allows faculty to develop programs as the need arises, (3) it streamlines the administrative aspects in that the School of Computing will have flexibility in creating such tracks, and (4) it allows students to be recruited into and given requirements in such areas of specialization within computing.

We are currently moving the request for this degree through the university administration, and look forward to the creation of specific tracks within the computing degree. Once this is achieved, we will have a structure that allows students to focus on pure computer science (the CS degree) or to work in interdisciplinary areas and get a degree in Computing.

We will keep you posted on the success of this venture! ☐☐

Contact Tom Henderson at director@cs.utah.edu



SIGGRAPH '02

San Antonio

The University of Utah contingent made its presence felt at the 2002 SIGGRAPH:

Presentations

- Real Time Ray-Tracer

Book Signings

- Pete Shirley "*Fundamentals of Computer Graphics*"
- Erik Reinhard "*Practical Parellel Rendering*"

Alumni Reception

- Patio Room at the Menger Hotel
Wednesday, July 24



David Weinstein demonstrates the RTRT.
(see page 7)



University of Utah Alumni Birds of a Feather Party.



Jim Blinn (PhD '78) and Jim Kajiya (BS '77, MS '77, PhD '79) at the Birds of a Feather Party.



Collette Mullenhoff (MS '99) and Rodney Bogart (MS '89) at the Birds of a Feather Party.



Pete Shirley signs his book at the AK Peters booth.

Photos by: Amy Gooch

Summer Interns Participate in Locomotion Interface Research

By William Thompson

Four undergraduate interns spent two summer months working in William Thompson's Perception and Graphics research group. Three of the students, Nausheen Malik, Sabina Siddiqi, and Larissa Winey, came from Mount Holyoke College in Massachusetts. The fourth, Scott Kuhl, studies at Augsburg College in Minnesota.

The interns participated in research on locomotion interfaces, which allow a user to walk naturally through a large scale virtual environment. They generated the computer graphics and real-time code necessary to support perceptual experiments aimed at exploring a person's perception of speed and distance traveled when walking on a locomotion interface. We already know that distance judgments when viewing computer graphics are poor. Though less is known about biomechanical perception of speed and distance traveled when walking on locomotion devices such as a treadmill, we believe that it is significantly different than when walking on normal surfaces in the real world. The virtual world models built by the interns will help us understand how imperfect spatial judgments based on viewing computer graphics interact with the imperfect biomechanical sensation of walking on a type of treadmill.



Nausheen Malik, Scott Kuhl, Larissa Winey, and Sabina Siddiqi.

An explicit goal of our internship program is to involve undergraduates in research in order to increase their interest in and preparation for graduate school. To do this, it is necessary to provide much more than the normal undergraduate research project. The National Science Foundation is funding both Mount Holyoke College and Augsburg College to collaborate with Utah's School of Computing in this effort. Mount Holyoke and Augsburg students spend the academic year gaining background knowledge and learning specific tools that they will need for their summer work.

Once at the University of Utah, they not only work on their assigned project but also get a greater perspective on the context for what they are doing by participating in research meetings and making presentations from the relevant research literature. We augment this with presentations and one-on-one mentoring to help them understand what graduate school is all about.

School of Computing staff supported the visitors, including Amy Gooch, Pete Willemsen, and psychology professor Sarah Creem-Regehr. ☐☐

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2002 Evans & Sutherland Distinguished Lecture Series

The Distinguished Lecture Series is made possible by a generous gift from the Evans & Sutherland Corporation. This is the 11th annual Evans & Sutherland sponsored lecture series. We are grateful for their generous support.

"We're excited to have speakers of exceptional creativity, leadership, and accomplishment in this year's lecture series," said series organizer Matthew Flatt.

October 7, 2002

Jason Mitchell

ATI Technologies, Inc.

"Applications of Next-Generation Programmable Graphics Hardware"

October 18, 2002

Ronen Barzel

Pixar Animation Studios

"Choreographing Dynamics"

October 21, 2002

John Harrison

Intel Corporation

"Automated Theorem Proving in Real Applications"

November 20, 2002

Philip Wadler

Avaya Inc.

"Can programming be as natural as 0,1,2,..."

November 25, 2002

Steve Seitz

University of Washington

"3D Photography"

Refreshments 3:20 p.m.

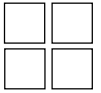
Lecture 3:40 p.m.

All lectures held in 103 Engineering and Mines Classroom Building.

We invite all alums to attend.

**Send news items to
teapot@cs.utah.edu**

MILESTONES



FACULTY

Sally McKee, Wilson Hsieh, John Carter and student **Venkata Pingali** won best paper awards at the International Conference on Supercomputing, held in Manhattan in June 2002.

Jay Lepreau and his **Flux Research Group** received a prestigious “Medium ITR” grant from the National Science Foundation. The \$1.5M award focuses on exploring the issues in federating diverse network testbeds and platforms, including transparency, resource allocation, and security. Researchers and educators at Duke, Brown, and Mt. Holyoke are collaborators in the effort.

ALUMNI



David Hart PDI/Dreamworks and Joe

David Hart (BS '97) gave a lecture and demonstration of PDI/Dreamworks technology from the film *Shrek* during New Major Day on August 28th, to an audience of new

computer science and computer engineering undergrads entering major status his fall semester.

Gershon Elber (PhD '92) completed a visit to Utah from the Technion in Israel to work with Elaine Cohen and Rich Riesenfeld on the analysis of trivariate NURBS.

NEW STAFF MEMBER



Anna Flowers

Anna Flowers joined the School of Computing in August. She is the newest member of the Student Services Team, hired to help advise graduate students and support graduate admissions. Anna has experience on campus working in the HPER and the Department of Ethnic Studies. She comes to us from KSL 1160AM, a local radio station. Anna is a native Utahn and graduated with a B.A. in Organizational Communication and a double minor in Spanish and Chicano Studies from the University of Utah.

Dave Hanscom Wins COE Outstanding Teaching Award

Professor Dave Hanscom was awarded the College of Engineering's Outstanding Teaching Award on August 19th. When making the presentation, Dean Jerry Stringfellow read comments from teaching evaluations to sum up Dave's dedication to the students. “You run a great program. You're tough and you stretch us and make us work hard, and even though we complain sometimes, in the end we will be more prepared for industry. Thanks.” Dave has been part of the faculty since 1982.



Dave Hanscom

MEB Remodel Nearing Completion



MEB hallway (before)



MEB hallway (after)



New Senior Hardware Labs



2002 School of Computing Research Support

School of Computing faculty research programs make a significant contribution to the state economy. Competitively awarded research funding provides support for staff and graduate students, and updates needed laboratory equipment and computers, enhancing the teaching environment to the benefit of all students.

Research expenditures, year ending June 30, 2002

National Science Foundation	7,280,531
Department of Defense	2,909,374
Department of Energy	2,064,555
National Institutes of Health	2,061,373
Industry/other	3,607
Total	14,319,440

Data compiled by Erin Davies.

The Real-Time Ray Tracer Debuts at SIGGRAPH 2002

By Greg Jones

Michelangelo's David; a large-scale seismic volume; the moons of Jupiter; four half-full wine glasses; the Greek Parthenon. What do these models have in common? They were all part of the Real-Time Ray Tracer (RTRT) demonstration at SIGGRAPH 2002, held in San Antonio, July 22-24. With support from SGI, researchers from SCI, GDC, VisSim, and the Graphics group designed, implemented, and premiered interactive ray-tracing of a complex virtual underwater world at the industry's top computer graphics conference.

Featuring four themed rooms, connected with transparent submerged tubes, the virtual tour carried audiences through scenes that demonstrated the application benefits of RTRT engine: photorealistic refraction, reflection, and shading; direct rendering of curved-surface models; and interactive manipulation and navigation of large-scale scientific data.

The RTRT research was pioneered by Steve Parker and Pete Shirley; the RTRT SIGGRAPH demo was led by

David Weinstein (SCI Institute PhD student and NCCR Technical Manager), and fellow team-leaders Dav de St. Germain, Helen H. Hu, William Martin, R. Keith Morley, and Chris Moulding; with huge technical support from James Bigler, Marty Cole, Dave DeMarle, Gordon Kindlmann, Aaron Lefohn, Brandon Mansfield, Simon Premoze, Shaun Ramsey, Erik Reinhard, and Chris Wyman; stunning artistic support from Richard Coffey, Nathan Galli, and Erik Jorgensen; and enormous facility, administrative, and additional support from Robert Cummins, Chuck Hansen, Chris Johnson, Greg Jones, and Blythe Nobleman.

The RTRT Team would like to gratefully acknowledge SGI for loaning us the equipment (128 processor Origin 3800) and research demonstration space for our SIGGRAPH 2002 RTRT demonstration. ☐☐

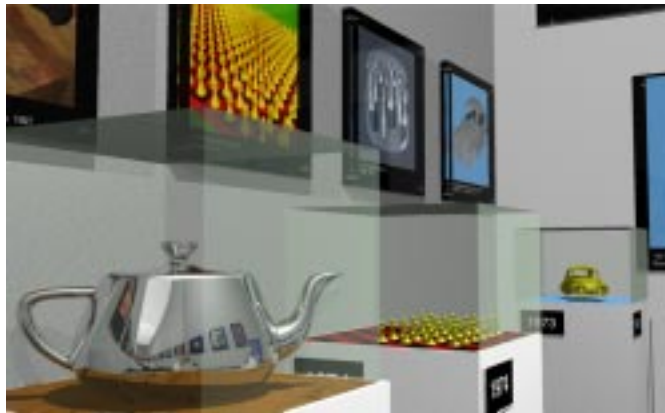


Image produced with Real-Time Ray Tracer

The Utah Teapot



A quarterly newsletter for alumni and friends of the University of Utah School of Computing.

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Iconography in the RTRT Museum

The **teapot** has become a favorite computer graphics icon. This is one of the many familiar objects found in the museum room. Other well-known icons shown here include:

- Martin Newell's **chess board**, of the first images created by using procedural modeling. In Newell's object-oriented framework, the models themselves are responsible for how they rendered, rather than relying on an external rendering algorithm.
- The **Volkswagon Bug** model, created by one of Ivan Sutherland's computer graphics class in the early 1970s. Using the measurements from Sutherland's vehicle, the students created an early example of a 3-D visualization of a large object using a points and polygons description.



CALENDAR



October 7, 2002

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"Applications of Next-Generation
Programmable Graphics Hardware"

October 18, 2002

Evans & Sutherland Distinguished Lecture
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"Choreographing Dynamics"

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Evans & Sutherland Distinguished Lecture
Philip Wadler
"Can programming be as natural as 0,1,2,..."

November 25, 2002

Evans & Sutherland Distinguished Lecture
Steve Seitz
"3D Photography"

November 28 - 29, 2002

Thanksgiving Break

December 5, 2002

Classes end

December 14, 2002 - January 5, 2003

Holiday Break

January 6, 2003

Spring Semester Begins



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