News & Notes from Sitterson Hall

Issue Fifteen, Spring 1995

Department of Computer Science
The University of North Carolina at Chapel Hill

In this issue

Chairman's corner

It is with mixed emotions that we announce that two members of our Computer Science family will soon retire. May 1995 will bring us our first retirement ever when Peter Calingaert, professor, leaves active service after 27 years with the Department. Peter joined us in 1968 as the Department's second full professor. In addition to a distinguished career as a teacher and scholar, Peter served as acting chairman from February through August 1970 (he hired me!) and from January through June 1975, and later served as associate chairman for academics from July 1989 through December 1992. He wrote Growth of a Department: A Personal History of Computer Science at UNC-Chapel Hill, which was recently published and distributed widely to Department alumni and friends. Peter will assume the title of professor emeritus and promises to keep in touch with us during the coming years. He recently remarked that it is important to retire to

something, not from something, so he looks forward to spending more time reading and traveling. And he probably won't be away from the classroom for very long. Peter's affinity for language and teaching is taking him to another career as a teacher of English as a second language. This is certainly relevant to Computer Science because English has become the international language for computer science research and publications.

At the end of June, Ralph Mason, associate chairman for administration and finance, will retire after 14 years of University service. We convinced Ralph to join us in May 1981 after his first retirement as a captain in the U.S. Navy. He has judiciously managed the Department through an extraordinary period of growth since 1981: the number of graduate students and full-time faculty have each nearly tripled, and total budgets have grown more than tenfold. His incredible understanding of the entire enterprise and his great talent and sincere dedication to sound resource and fiscal management have contributed mightily to our success in winning and keeping many external contracts and grants. Ralph was also a key player in the planning and design of Sitterson Hall, where we consolidated from six buildings to one in the summer of 1987. Indeed, he leaves a very big pair of shoes to fill! Ralph hopes to spend more time with his large and growing family (he has five grandchildren--three boys and two girls--with another on the way), and--for those who know him this won't come as any surprise--on the golf course.

It is with a collective and full heart that we wish Peter and Ralph a long, fruitful, and much deserved happy retirement.

Steve Weiss

Ralph Mason (left) and Peter Calingaert in our video conference room. (Photo by Bo Strain.)

Welcome!

New appointment

Russell M. Taylor, II (Ph.D. 1994), research assistant professor. Russell earned a B.S. in mathematical sciences (1989), and an M.S. (1991) and Ph.D. (1994) in computer science from UNC-Chapel Hill. He is serving as the team leader for the Nanomanipulator project and is developing a new application programmer's interface for the head-mounted display group. His research areas are scientific visualization, distributed computing, and virtual environments.

Visiting scholar

Mary Whitton joined the Head-Mounted Display project in fall 1994, serving as project manager for virtual environments research. Mary has an M.S. in electrical and computer engineering from N.C. State. She has been involved in computer graphics system development since 1976 and has served as vice president of two computer graphics hardware companies and, most recently, as director of market development for interactive technologies at Sun Microsystems Laboratories, in Research Triangle Park, N.C. Mary is the current chair of ACM SIGGRAPH.

New students, spring 1995

- Rui Bastos
- Siddharth Bedi
- Chun-Fa Chang
- Michael Meehan
- Anatoli Shaykevich
- Christine Yao

New staff members

Candice Lee Autry, receptionist, who joined us in March. Candice graduated from N.C. State in May 1993 with a B.A. in psychology with a human resource development specialty. She formerly worked as a family services assistant for the Easter Seal Society of North Carolina, in Raleigh, N.C. Prior to that she held two part-time, temporary positions and worked as an intern in the Easter Seal Society's human resources department.

Claire L. Stone, editorial assistant, who joined us in January. She received her M.A. in comparative literature from UNC-Chapel Hill in December 1994. Most recently she worked part-time for John Smith, associate professor, and the Collaboratory and as a typesetter at Colonial Press in Chapel Hill.

We say thanks and farewell to:

Leigh Atkinson, who left us in March to take a job at the Kenan-Flagler Business School at UNC-Chapel Hill, where she works as the administrative assistant to the director of the annual fund and alumni affairs. She also works closely with the director of major gifts and special projects. During her nine months with the Department, Leigh was our receptionist.

Kristie Weisner, who left us in December to pursue an M.A. in exercise physiology at UNC-Chapel Hill. For the past two and a half years, Kristie worked as the assistant editor for the Department's publications, including News & Notes, the admissions brochure, admissions poster, and Department brochure. In her graduate program, Kristie also teaches aerobics and works part-time at the "Heels for Health" program and the Student Wellness Center.

And, of course, to Peter Calingaert and Ralph Mason (see the Chairman's corner).

In Memoriam

Staff member dies

As we go to press we have learned that Belmon Dean, Jr., electronic technician for Computer Services, has passed away. Belmon died on 3 April 1995 at Durham Regional Hospital of complications resulting from surgery. He was 57 years old. Belmon had worked with our Department since 1983. During that time he helped maintain our computer systems, peripheral devices and office equipment, bringing him into contact with almost all our faculty, staff, and students. He was a vital part of the move to Sitterson Hall when we consolidated from six buildings into one in 1987. He leaves a wife, Lena, who also works for UNC-Chapel Hill, five children, and several grandchildren. We will all miss Belmon very much.

Graphic artist dies

We sadly announce the death of Cranine K. Brinkhous, an artist and illustrator at UNC Printing and Duplicating, who assisted the Department with its publications. Cranine died on 22 March 1995 at UNC Hospitals in Chapel Hill, at the age of 51. She first worked with us in 1987 when she sketched the newly completed Sitterson Hall for our dedication program. Since then, her design talents have helped enhance many of our publications, especially our admissions posters and Department brochures. Cranine will be greatly missed.

Alumni news

We recently received a record number of donations from our alumni! We thank each one of you for your generous support.

Congratulations to Steve Bellovin (Ph.D. 1982) who was recently recognized with the third annual USENIX Lifetime Achievement Award for his joint work in creating USENET. The award honors those who have materially changed the world with their contributions to network technology. Bellovin and his co-creators, Tom Truscott and Jim Ellis, were presented with the award at the USENIX Technical Conference in New Orleans, La. The three were computer science graduate students when they created USENET 15 years ago. Steve is a Ph.D. graduate of UNC-Chapel Hill, Tom is a Ph.D. graduate of Duke, and Jim is an M.S. graduate of Duke. The award also honors the thousands of participants and supporters who have contributed to USENET over the years, and who are too numerous to name.

A book co-authored by Bellovin and William Cheswick, entitled Firewalls and Internet Security: Repelling the Wily Hacker, was published in 1994 by Addison-Wesley.

Ritu Chadha (Ph.D. 1991) is currently working in the applied research area at Bellcore in Morristown, N.J. She recently published a number of papers:

- Chadha, R., and I. Sebuktekin. "Symbolic Simulation: Theory and Application to Protocol Modeling and Validation," Proc. International Conference on Network Protocols, Boston, Mass., Oct. 1994.
- Chadha, R., and D. A. Plaisted. "Correctness of Unification without Occur Check in Prolog," Journal of Logic Programming, 18(2), Feb. 1994, 99-122.
- Chadha, R., S. Narain, and O. Cockings. "PHOTON: A Software System for SONET Interoperability Analysis," Proc. GLOBECOM '93, Houston, Texas, Dec. 1993.
- Chadha, R., S. Narain, and O. Cockings. "A Formal Model of SONET's Alarm-Surveillance Procedures and Their Simulation," Proc. Sixth International Conference on Formal Description Techniques, Cambridge, Mass., Oct. 1993, 237-252.
- Chadha, R., and D. A. Plaisted. "Finding Logical Consequences Using Unskolemization," Proc. Seventh International Symposium on Methodologies for Intelligent Systems, Lecture Notes in Artificial Intelligence 689, Trondheim, Norway, 15-18 June 1993, 255-264.
- Chadha, R., and D. A. Plaisted. "On the Mechanical Derivation of Loop Invariants," Journal of Symbolic Computation, 15(5/6), May/June 1993, 705-744.

Bill O. Gallmeister (M.S. 1988) recently had his book, POSIX.4: Programming for the Real World, published by O'Reilly and Associates (ISBN: 1-56592-074- 0). Until recently, Bill served as vice chair of the IEEE POSIX.4 working group. He and his wife Eleanor live with their year-and-a-half-old son, Ian, in Los Gatos, Calif. Bill is currently working for the First Virtual Corporation on networked delivery of multimedia to the corporate (or university) desktop, using ATM. He can be reached at bog@fvc.com or b0g@ix.netcom.com.

Gopal Gupta (Ph.D. 1992) recently had his revised and enhanced Ph.D. dissertation published in book form by Kluwer Academic Publishers under the title Multiprocessor Execution of Logic Programs.

After graduating, John Hilgedick (M.S. 1993) worked for several months in our Department for the Collaboratory before taking a job in September 1994 as a software engineer at BroadBand

Technologies in Research Triangle Park, N.C., where he works on video-on-demand for television sets.

Lawrence Lifshitz (Ph.D. 1987) has been working at the University of Massachusetts Medical Center in Worcester, Mass., for the past seven years. He does research in biomedical image analysis and computer graphics, primarily to aid research in cellular physiology. Lawrence has been married for three years and has a one-year-old son. He reports that he now plays tennis ambidextrously since reinjuring his right shoulder and that he has recently mastered the windsurfing waterstart technique! He can be reached at lml@vision.ummed.edu and invites friends visiting the Boston area to stop by.

A book about computer arithmetic by Amos Omondi (Ph.D. 1990) was recently published by Prentice-Hall. The book is entitled, Computer Arithmetic Systems: Algorithms, Architecture, and Implementations.

Following graduation and a trip to Korea, Injong Rhee (Ph.D. 1994) has been working as a post-doctoral student at the University of Warwick in Coventry, England.

Edilberto "Bong" Uichanco (M.S. 1988) resides in the Philippines where he works with a company called Software Ventures International Corp., that deals in many aspects of information technology including software development, consultancy, data entry, mapping and graphics, data communications, and equipment sales. He manages a department that designs and sells wide area network and local area network solutions. Bong congratulates the Department on its growth and praises Peter Calingaert's history, Growth of a Department, which has brought him many fond memories of Sitterson Hall and life in Chapel Hill. He invites anyone planning a trip to the Philippines to contact him for a tour of the country's best beaches! Bong can be reached at uichanc@misa.pfi.net.

Amitabh Varshney (Ph.D. 1994) joined the computer science faculty at the State University of New York at Stony Brook as an assistant professor in fall 1994. He recently won a three-year NSF Career (Research Initiation) award.

Please let us know where you are and what you are up to so we can tell your former classmates and friends! Send information via e-mail to pubs@cs.unc.edu; or FAX it to (919) 962-1799; or send it to News & Notes, Department of Computer Science, CB#3175, Sitterson Hall, UNC-Chapel Hill, Chapel Hill, NC 27599-3175.

Alumni electronic mailing list

Next time you are logged on, please send your Internet address to pubs@cs.unc.edu. We are compiling an electronic mailing list of our alumni so that we may more quickly send you announcements such as job postings, special Department events, or other items that may interest our alumni. We will not share your address nor use it for other purposes without your permission. Thank you!

Undergraduate alumni news*

An illustration program called Lightning Draw GX, created by Humayun Lari (B.S. 1995), was featured in the 16 January 1995 issue of MacWeek. According to the article, LightningDraw is the "first drawing application to incorporate the color and type capabilities of GX. The application combines object oriented drawing tools with paint features." Lari demonstrated the program at the Macworld Expo in San Francisco, Calif., in January 1995.

As a student, Lari wrote "PrintTuring," which has been used in COMP 114 ever since. Since leaving UNC-Chapel Hill he has started his own software company, Lari Software, in Chapel Hill. He can be reached at (800) 933-7303 or at hlari@cybernetics.net.

Dong-Yong Oh (B.S. 1993) recently presented a paper at the SPIE Multimedia Computing and Networking 1995 Conference. The paper, entitled "Content- based Multimedia Synchronization," was co-authored by S. SampathKumar and P. Rangan. Dong-Young is currently attending graduate school at the University of California at San Diego.

(*Computer Sciences Options of the Applied Sciences and Mathematical Sciences Curricula)

Commencement

Graduation exercises for UNC-Chapel Hill will be held at 9:30 a.m. on 14 May 1995, at Kenan Stadium. The Computer Science Department's own graduation ceremony will take place the same day at 1:00 p.m., in the lobby of Sitterson Hall. Please join us if you plan to be in the area.

Family matters

Nathan Thomas Anderson-Stahl was born on 22 August 1994 in Harrisburg, Pa., to Beth Anderson and David Stahl (M.S. 1994).

Charles Mihiel Bennett was born on 15 December 1994 in Chapel Hill, N.C., to Irina M. Dolgopolova and Brad Bennett.

Laura Michaela Boggs was born on 25 December 1994 in Durham, N.C., to Donna and Gary Boggs. She has an older sister named Erin, who is six years old.

Ghilman Davis Brock was born on 5 March 1995 in Asheville, N.C., to Sue Stigleman and Dean Brock.

Katherine Noelle Herring was born on 20 December 1994 in Raleigh, N.C., to Kim Herring (formerly Blakeley, M.S. 1990) and Alex Herring.

Dinesh Manocha and Ming C. Lin were married on 20 August 1994 in Palo Alto, Calif.

Amelia Rimera Binotti Riely was born on 4 November 1994 in Chapel Hill, N.C., to Lucia Binotti and James Riely.

Rachel Bopha Skinner was born on 26 September 1994 in Philadelphia, Pa., to Pha and Andy Skinner (M.S. 1989). She has an older brother Nathaniel Phakdey who is two years old.

Research highlights

Brooks inducted into Royal Academy

In late November 1994, Fred Brooks, Kenan professor, was inducted into the British Royal Academy of Engineering (RAE) and awarded a Distinguished Fellowship from the British Computer Society. Two nights later, Fred gave a public lecture, "Is There Any Real Virtue in Virtual Reality," at the Institute of Electrical Engineers' (IEE) hall in London. The lecture, attended by several hundred people, was co-sponsored by the IEE and the RAE. The London office of Division, Ltd. provided demonstrations in conjunction with the public lecture.

The installation ceremony for the Royal Academy was a posh affair with attendance limited to official Fellows (not even spouses could attend). Wearing black ties and tuxedos, all of the guests stood behind their chairs during the preliminaries, in the thirty-foot high Merchant Taylors' guild hall, surrounded by fine hardwood furnishings, massive oil portraits, and gilt, while the Toastmaster pounded the floor with his staff and shouted: "My lords, ladies, and gentlemen, I prithee peace, for [the grace, the several toasts, etc.]." The Fellows were advised to arrange for their "carriages at 10 p.m." Fred said, "I was never before even near an occasion as formal and elegant as the RAE induction."

Fred is the 15th person to receive the Distinguished Fellow award from the British Computer Society. Bill Gates of Microsoft was the 14th.

During their eight-day stay in England, Fred and his wife, Nancy, also visited Warwick and Winchester. Fred gave four other lectures to IBM audiences. While in London, Fred and Nancy, who are interested in church architecture, were able to visit most of the approximately 20 surviving churches of the 51 designed by Sir Christopher Wren after the Great Fire of London in 1666.

Distinguished lecturers

This spring the Department initiates its Distinguished Lecturer series. Three distinguished researchers present talks during March and April.

On 1 March, Fred B. Schneider, professor of computer science at Cornell, spoke on "Adding Fault-tolerance, Virtually." Schneider reported that a prototype implementation has been constructed by researchers at Cornell to sup-port replica coordination in the hypervisor of a

virtual machine layer. He described the advantages of this approach, the requirements it imposes on real and virtual machine interfaces, and the protocols that make it work.

At Cornell, Schneider conducts research in concurrent programming and distributed systems. He was involved in the design of the next-generation air traffic control system called AAS, and is a fellow of AAAS and ACM.

On 31 March, Maurice V. Wilkes, of Olivetti Research in Cambridge, England, presented a talk entitled "Faster and Faster, Hotter or Cooler." According to Wilkes, processor chip designers have, in recent years, been preoccupied with realizing the steady increase in performance made possible by the onward march of silicon technology. Interest has also arisen in chips with very low power consumption for use in hand-held computers and other applications. Wilkes commented on these and related works.

Wilkes is a Distinguished Fellow of the British Computer Society, a Fellow of the Royal Society, and a Fellow of the Royal Academy of Engineering. He is a Foreign Associate of the U.S. National Academy of Sciences and the U.S. National Academy of Engineering. He delivered the ACM Turing Lecture in 1967.

On 19 April, Andrew Witkin, professor of computer science at Carnegie Mellon University, will speak on "Physically Based Modeling and Interactive Simulation." Witkin will present an overview of his work using physical simulation and optimization as a way to make, animate, and interact with geometric models. His work is based on the premise that physics makes a good user interface. Witkin will conclude with some solutions to the problem of animating live, purposeful characters who can perform their appointed tasks in a mechanically efficient way.

At Carnegie Mellon, Witkin conducts research in computer vision and computer graphics. His awards include Best Paper prizes at several prestigious conferences on artificial intelligence and graphics. He is a Fellow of the American Association for Artificial Intelligence.

The organizing committee for the Distinguished Lecturer Series includes chairperson, James Anderson, assistant professor, and committee, Sid Chatterjee, assistant professor, Prasun Dewan, associate professor, Kevin Jeffay, assistant professor, and Kim Passarella and Jason Wilson, graduate students.

Medical image group works on grant renewal

The Advisory Committee of the UNC Medical Image Display and Analysis Group met from 24-25 February 1995 to select projects and subprojects for the renewal application of their grant. Presentations focused on proposed projects in core-based image analysis and visualization for planning and execution of radiotherapy and surgery. The project began seven years ago with a grant from the National Institutes of Health. It was last renewed three years ago. Stephen Pizer, Kenan professor, is the principal investigator.

Conferences & workshops

STC at Supercomputing '94

The Science and Technology Center (STC) for Computer Graphics and Scientific Visualization was a major presence at the Supercomputing '94 Conference, held in Washington, D.C., from 14-18 November 1994. This annual event is the premier conference in the supercomputing discipline. Members of the five schools that comprise the STC (UNC-Chapel Hill, Brown, Caltech, Utah, and Cornell) worked together to build a large booth depicting the STC's ongoing research in computer graphics. Construction of the 20-by-30-foot booth (larger than those of many vendors) was a huge undertaking.

Students from all five schools gave interactive demonstrations of their graphics research to visitors. The demonstrations were run on six workstations which had been loaned to the STC by Hewlett Packard. A virtual reality demonstration on the ProVision 100 system (from Division, Inc.) showed how UNC-Chapel Hill's Pixel-Planes 5 technology has been incorporated into a commercial product. The walls of the booth were decorated by enormous and beautiful photographs that were created on a new printer at the University of Utah. Two of these images illustrated ongoing research at UNC-Chapel Hill and showed how physicians of the future may have "x-ray vision," allowing them to see an unborn fetus inside the mother's womb, by superimposing ultrasound data together with a video view of the mother in real time. The booth included a walk-in 360-degree synthetic rendering of Frank Lloyd Wright's Fallingwater, which was produced at Cornell; machined parts designed and milled at Utah; cellular simulation and MRI work from Caltech; and 3D widget and flow visualization research from Brown. The booth was judged a success by all who visited it.

Faculty, staff, and students from our Department who attended the convention and helped out at the booth included Henry Fuchs, Federico Gil professor, Greg Turk, research assistant professor, Michael North, systems programmer, and Daniel Aliaga, graduate student. Many other Department members also put in a great deal of time setting up the booth.

Axiomatic vision workshop

The Axiomatic Vision Workshop was held at UNC-Chapel Hill from 9-11 November 1994 and was hosted by Stephen Pizer. Participants discussed the mathematical foundations of human and computer vision. Leading the discussions were Christina Burbeck, research associate professor, David Eberly, research associate professor (Ph.D. 1994), and Stephen Pizer, UNC- Chapel Hill; Luc Florack, postdoctoral fellow, Universidade de Aveiro, Portugal; Benjamin Kimia, assistant professor, Brown University; Tony Lindeberg, research assistant professor, KTH, Stockholm; Bart ter Haar Romeny, associate professor, University of Utrecht, the Netherlands, and Ross Whitaker (Ph.D. 1993), researcher, ECRC, Munich.

VRAIS '95 symposium

Virtual reality work by scientists at UNC-Chapel Hill, Division, Inc., and other local researchers was featured at VRAIS '95, the IEEE Virtual Reality Annual International Symposium, which took place in Research Triangle Park, N.C., from 11-15 March 1995. The VRAIS conferences serve as forums for scientists and engineers from around the world to discuss significant research

results in their work on virtual reality. Local researchers presented papers on head-mounted display and tracking technologies, human factors issues, and related subjects. Conference participants were given the opportunity to tour our Graphics and Image Lab and the Applied Virtual Reality Lab at Research Triangle Institute. Division offered live demonstrations of its virtual reality systems.

Several UNC-Chapel Hill faculty, staff, and students participated in the conference. Henry Fuchs gave an invited talk entitled, "Research Challenges in Virtual Environments: The Race Between Achievements and Expectations." Fred Brooks was one of the featured speakers in the "Dialogue on Virtual Environments" session. Jannick Rolland, research assistant professor, gave a tutorial entitled, "Fundamentals of Optics in Head-Mounted Displays." She also co-authored two papers presented at the conference and served as local arrangements chair. Anantha Kancherla, graduate student, co- authored a paper with Jannick, and Mike Bajura, graduate student, co- authored a paper with Ulrich Neumann (Ph.D. 1993), who is now at the University of Southern California. Nick England, research professor, helped to stage an exhibit on virtual reality and interactive 3D graphics research in North Carolina. The exhibit, which included a videotape, posters, and brochure, featured research at UNC-Chapel Hill.

VLSI conference

The 16th Conference on Advanced Research in VLSI was held in Chapel Hill, N.C., from 26-29 March 1995. The conference is a forum for interdisciplinary research involving VLSI design methods, systems, architectures, circuits, CAD, and theory.

This year's conference was co-sponsored by MIT and UNC-Chapel Hill. William Dally of MIT was the program chair. Vernon Chi, director of the Microelectronic Systems Laboratory (MSL), and John Poulton, research associate professor, were co-chairs for local arrangements. Sherry Palmer, assistant to the MSL, was conference manager.

The Department of Computer Science hosted a virtual worlds demonstration night and gave tours of the Graphics and Image Lab and the MSL to conference participants on 27 March. Research featured in the demonstrations included architectural walkthrough, molecular docker, and head-mounted visual display.

Symposium on interactive 3D graphics

UNC-Chapel Hill will make an impressive showing at the ACM 1995 Symposium on Interactive 3D Graphics, to be held in Monterey, Calif., from 9-12 April 1995. All nine of the papers submitted from our Department were accepted, and account for nearly one third of the 33 papers accepted for presentation at the symposium. The papers are:

- Chen, D. T., A. State, and D. Banks. "Interactive Shape Metamorphosis."
- Cohen, J. D., M. C. Lin, D. Manocha, and M. K. Ponamgi. "I-COLLIDE: An Interactive and Exact Collision Detection System for Large- Scale Environments."
- Finch, M., M. Falvo, V. L. Chi, S. Washburn, R. M. Taylor, and R. Superfine. "Surface Modification Tools in a Virtual Environment Interface to a Scanning Probe Microscope."

- Kumar, S., D. Manocha, and A. Lastra. "Interactive Display of Large-Scale NURBS Models."
- Lastra, A., S. Molnar, M. Olano, and Y. Wang. "Real-Time Programmable Shading."
- Luebke, D. P., and C. Georges. "Portals and Mirrors: Simple, Fast Evaluation of Potentially Visible Sets."
- Mueller, C. "The Sort-First Rendering Architecture for High-Performance Graphics."
- Olano, M., J. Cohen, M. Mine, and G. Bishop. "Combatting Rendering Latency."
- State, A., J. McAllister, U. Neumann, H. Chen, T. J. Cullip, D. T. Chen, and H. Fuchs. "Interactive Volume Visualization on a Heterogeneous Message- Passing Multicomputer."

Also at the conference, Henry Fuchs will chair a session on virtual reality and will speak during the closing session on "Interactive 3D Graphics: Challenges and Opportunities."

Research and study assignment

During his fall 1994 research and study assignment, Jonathan Marshall, assistant professor, spent most of his time in Chapel Hill, working on several papers. He also made five short trips to explore research and collaboration opportunities in labs at China Lake Naval Air Warfare Center, the University of Oregon, Smith-Kettlewell Eye Research Institute, Oxford University, and Baylor College of Medicine.

Division, Inc. signs agreement with VWE

Last fall, Division, Inc. signed an agreement to provide Virtual World Entertainment (VWE) with its VPX graphics boards for use in VWE's entertainment centers around the world. VWE's initial order of VPX boards is worth more than $2 million.

The VPX board is an image generator based on Pixel-Planes technology licensed by Division from the Computer Science Department at UNC-Chapel Hill. The boards will allow VWE to create 3D games with interactive response times and a high level of visual realism.

VWE has 16 virtual world centers in America and Japan, with an additional 10 sites scheduled to open worldwide next year. The centers provide fully immersive virtual reality experiences, where players climb into individual cockpits and compete against one another in the virtual worlds of their choice.

"Division's VPX boards will make it possible for our venues to offer the player an enthralling experience," said Jordan Weisman, VWE's president. "Division's advanced hardware and their software experience will help us to meet the challenging requirements for our next generation of centers."

Division's PC-based VPX board incorporates massively parallel rendering technology that generates 150,000 texture-mapped polygons per second and has a screen-fill performance of more than 900 megapixels per second. It is available as a board that can be integrated into an original equipment manufacturer's PC platform or as a fully configured development platform

called ProVision Merlin, which includes Intel's Pentium processor, VPX graphics cards, and software development tools. ProVision Merlin is a complete solution for developing location-based entertainment games.

Kudos for Division product based on UNC-Chapel Hill research

The Pixel-Planes 6 system developed by Division, Inc., of Chapel Hill, and based on Pixel-Planes technology, has been named among the "Top 10 Hardware Products of 1994" by reviewers for IEEE Computer Graphics and Applications Magazine. An article in the January 1995 issue provided the following description: "The massively parallel Pixel Planes 6 system by Division can render up to 5 million Gouraud-shaded and 4 million Phong- shaded triangles per second with spectacular lighting and photo-texturing, according to the company. Each Pixel Planes 6 Renderer board contains an array of 16,384 processors. The Pixel Planes 6 starts at $200,000" (p. 90).

Coggins serves as expert witness

James Coggins, associate professor and associate chairman for academic affairs, recently served as an expert witness on behalf of IBM in a multi- million dollar civil lawsuit held in Texas. On 13 January, the judge issued a summary judgment which ruled in IBM's favor, canceling the trial which had been scheduled to begin on 23 January. This is the second legal victory that IBM has won with the assistance of UNC-Chapel Hill computer science faculty testifying as expert witnesses. In 1994 Steve Weiss, professor and chairman, also testified on IBM's behalf.

New contracts and grants

PI: David Beard, adjunct associate professor of computer science and research associate professor of radiology. "Development of a Common Database for Digital Mammography Research," subcontract of an Army Research Grant from the University of Chicago.

PIs: Fred Brooks, Kenan professor, and Russell Taylor, research assistant professor. "Design of a Real-time, Fully Interactive Interface for Scanning Probe Microscopes," from the National Science Foundation.

PI: James Coggins, assistant professor. "Research Development Grant," from the Arts and Sciences Foundation.

PI: Prasun Dewan, associate professor. "Infrastructure and Tools for Distributed Collaborative Software Engineering," from the University of Minnesota.

PI: Jan Prins, associate professor. "Research Development Grant," from the Arts and Sciences Foundation.

Recent publications

Basch, B., D. Becker, S. J. Bharrat, J. D. Loop, R. K. Singh, J. Symon, and D. Winkelstein. "VISTAnet Deployment and System Integration Experiences," IEEE JSAC, 12(6), Aug. 1994, 1097-1109.

Chatterjee, S. "Locality, Communication, and Code Generation for Array- Parallel Languages," Proc. Seventh SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, Calif., 15-17 Feb. 1995, 656-661.

Chatterjee, S., J. R. Gilbert, R. Schreiber, and T. J. Sheffler. "Modelling Data-Parallel Programs with the Alignment-Distribution Graph," Journal of Programming Languages, 2, Sept. 1994, 227-258.

Chu, H., and D. Plaisted. "Model Finding in Semantically Guided Instance- based Theorem Proving," Fundamenta Informaticae, 21(3), 1994, 221-235.

Dewan, P., and R. Choudhary. "Coupling the User Interfaces of a Multiuser Program," ACM Transactions on Computer Human Interaction, 2(1), Mar. 1995.

Eberly, D. "A Differential Geometric Approach to Anisotropic Diffusion," Geometry-Driven Diffusion in Computer Vision, Computational Imaging and Vision Series, B. ter Haar Romeny, ed., Kluwer Academic Publishers, 1994, 371-391.

Eberly, D. "Fast Algorithms for Ridge Construction," Proc. SPIE Photonics East 1994: Vision Geometry III, 2356, 1994, 231-242.

Eberly, D., R. Gardner, B. Morse, S. Pizer, and C. Scharlach. "Ridges for Image Analysis," Journal of Mathematical Imaging and Vision, 4, 1994, 351-371.

Fuchs, H., G. Bishop, K. Arthur, L. McMillan, R. Bajcsy, S. Lee, H. Farid, and T. Kanade. "Virtual Space Teleconferencing Using a Sea of Cameras," Proc. First International Symposium on Medical Robotics and Computer- Assisted Surgery, 2, Pittsburgh, Pa., 22-24 Sept. 1994, 161-167.

Lee, S.-J., and D. Plaisted. "Problem Solving by Searching for Models with a Theorem Prover," Artificial Intelligence, 69, 1994, 205-233.

Lee, S.-J., and D. Plaisted. "Use of Replace Rules in Theorem Proving," Methods of Logic in Computer Science, 1, 1994, 217-240.

Manocha, D. "Computing Selected Solutions of Polynomial Equations," ISSAC, Oxford, England, 1994, 1-8.

Manocha, D. "Solving Polynomial Systems Using Matrix Computations," Advances in Computational Mathematics, H. P. Dikshit and C. A. Micchelli, eds., Singapore: World Scientific, 1994, 99-130.

Manocha, D., and J. F. Canny. "Efficient Inverse Kinematics for General 6R Manipulators," IEEE Trans. on Robotics and Automation, 10(5), 1994, 648-657.

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In the media

Gary Taubes's article, "Taking the Data in Hand--Literally--With Virtual Reality," which appeared in the 12 August 1994 issue of Science (pp. 884-886), included a lengthy discussion of our Nanomanipulator project.

Our virtual environments research was one of approximately 60 stories covered in the 30 September 1994 publication of the Sixth Electronic Times, a supplement to News Photographer Magazine. The supplement was prepared by attendees of the Electronic Times Workshop held recently in Chapel Hill and sponsored by the National Press Photographers Association. The article by Robin Marin was entitled, "It's a Virtual World Inside Chapel Hill's Virtual U."

Footage of UNC-Chapel Hill's molecular modeling research was shown in an episode of the PBS series "Future Quest" which aired in fall 1994.

An article written by I. Peterson, "Reflections of Clinical Reality," which appeared as a sidebar to Elizabeth Pennisi's article "Twirling Ribbons, Billowing Bubbles" in the 19 November 1994 issue of Science News (146(21), p. 330) featured our ultrasound research.

UNC-Chapel Hill's PixelFlow system was mentioned in an article entitled, "Virtual Reality Check: Imaginary Environments are Still Far From Real" in the December 1994 issue of Scientific American.

Another article on our ultrasound research entitled, "New Ultrasound Technique Brings the Unborn into Sharper Focus" by Caroline Dopyera, appeared in the 6 January 1995 issue of the Raleigh News & Observer.

James Coggins appeared as a guest on the cable TV program "Chapel Hill Almanac" in January 1995. He was interviewed by the program's host, Roland Giduz, about virtual reality. James was

also interviewed for an article on virtual reality which appeared in the Christian Science Monitor on 24 January. His work on computer tools for assessing hyperemia (eye redness) has also appeared in several newspapers and on Voice of America radio.

Some of our special visitors

Linda Houseman, public affairs and special projects coordinator for graphics, reports that 1,561 people visited the Graphics and Image Lab during 1994! Some of these and other guests who visited other research areas of the Department during fall 1994 and spring 1995 are highlighted here:

A major ARPA site visit took place on 25 January 1995. Researchers from UNC-Chapel Hill, Division, Inc., ARPA, and other organizations met to discuss head-mounted display research and to formulate goals and a vision for the future. Participants included Lt. Col. Frank Case, Col. Mike Francis, Gary Jones, Pradeep Khosla, and Dick Urban of ARPA; John Austin and Charles Grimsdale of Division; Doug DeFoe, Ben Mall, and Shaun McIntyre of Kaiser Electro-Optics; Mark Spitzer of Kopin Corp.; Donald Flaggs of Lockheed Palo Alto Research Center; Mark Comtois of PRC, Inc.; Charles Kanewske and Ron Kendrick of SAIC; James W. P. Goodnight of Space Applications Corporation; DeVere Henderson and Paul Maassel of SRS Technologies; Kathleen Griggs of System Planning Corporation; Charles Benton of TSI; and Michael Kelley of USC Information Sciences Institute.

Patrick Cerisier, a graduate student in electrical engineering at the National Institute of Applied Sciences (INSA) in Lyon, France, is interning here as part of his course of study. He is visiting Stephen Pizer and is working on the Voxel-man project from February to July 1995.

Dick Craddock (M.S. 1986) and Steve Lemke of Radius, Inc., Sunnyvale, Calif., visited on 4 October 1994 to talk to faculty and students about computer graphics and virtual environments research, digital video, digital audio, and audio and video compression. Craddock gave a talk on desktop digital video.

Luc Florack, postdoctoral fellow at the Universidade de Aveiro, Portugal, visited on 8 November 1994 and gave a talk entitled, "The Optic Flow Constraint Equation: Compatibility with the Scale-Space Paradigm." Stephen Pizer was his host.

Guido Gerig, assistant professor at ETH-Zurich, Switzerland, visited from 10- 11 October 1994 and presented two talks: "Multi-scale Ridge Detection" and "MMA Generation via Wave Equation." Stephen Pizer was his host.

Eric Henderson of Iowa State University visited the Graphics and Image Lab on 21 November 1994 to use the Nanomanipulator system to study fruit-fly chromosomes. He was pleased with the results and plans to send a student here with new samples for additional studies.

Larry F. Hodges of the Georgia Institute of Technology, visited on 3 November 1994 and presented a colloquium entitled, "Presence as the Defining Factor in a VR Application." Dinesh Manocha was his host.

Twenty-two members of the IBM Academy of Technology visited on 10 November 1994.

David Kotz, assistant professor of computer science at Dartmouth College, visited on 26 January 1995 and presented a talk entitled, "Dynamic File-Access Characteristics of Production Parallel Scientific Workloads." Lars Nyland was his host.

Marc Levoy (Ph.D. 1989) of Stanford University visited on 19 October 1994 and spoke about his recent work on 3D FAXing.

Tony Lindeberg of the Royal Institute of Technology, Stockholm, Sweden, visited from 4-7 October 1994. He presented two research colloquiums: "Scale Selection for Differential Operators" and "Direct Estimation of 3-D Surface Shape from Affine Distortions of Local 2-D Structure." Stephen Pizer was his host.

Tom Massie, an MIT graduate student and inventor of the Phantom low-cost force display device, visited on 19 August 1994.

Richard Morgan and David Evans of the Wolfensohn Foundation visited on 16 August 1994.

Herbert Muschamp, architecture critic for The New York Times, visited on 4 November 1994 to look at work on the architectural walkthrough project in preparation for an article.

Terry Nuhn of the Smithsonian Institution in Washington, D.C., visited on 22 September 1994.

Ronald Pose from Monash University in Australia, currently on sabbatical at the University of Washington, visited on 19 October 1994. He spoke at Graphics lunch on "Engineering Tradeoffs Involved in the Creation of a Low Latency Virtual Reality Display System Employing an Address-Recalculation Pipeline."

Diane Pozefsky (Ph.D. 1979), an IBM Fellow, visited on 19 October 1994. She presented a talk entitled, "Networking: Knaves, Niches, and Nuggets," and a reception was given in her honor.

Jack Robinson of Astounding Technologies in San Diego, Calif., visited on 26 August 1994.

Klaus Schultern, distinguished biochemist at the University of Illinois, visited on 3 March 1995.

Don Stewart, Phil Ebersol, Fred Kitson, Mike Myshatyn, and Steve Becker of Hewlett-Packard visited the Graphics and Image Lab on 19 October 1994.

Gabor Szekely from ETH-Zurich, Switzerland, visited from 10-11 October 1994. He spoke at Image lunch, then presented another talk on 3D medial axes to people interested in that particular area. Stephen Pizer was his host.

Lynn TenEyck, former research associate professor with our Department, visited on 12 September 1994.

Pamela J. Vermeer from Washington Lee University visited on 31 October 1994, and presented a colloquium entitled, "Validity Determination for MAT Object Representation." Dinesh Manocha was her host.

Christer Wikner and Ulrika Nilsson, students in the department of molecular biology at Uppsala, Sweden, visited the GRIP project on 14 February 1995.

Hiroyuki Yamamoto and Hidey Tamura of Canon Media Technology Labs in Japan visited on 11 October 1994. Yamamoto present-ed an informal talk on their work. Henry Fuchs was their host.

Karel Zuiderveld from Utrecht University visited on 10 October 1994 to meet with people interested in discussing issues of volume visualization, OOP, and image I/O.

CSA news

The Computer Science Students Association (CSA) kept busy during 1994 and plans to stay just as busy during 1995!

Activities during 1994 included:

CSA cabinet elections. The 1994-95 CSA officers are: Greg Welch, President; Jason Smith, Minister of Sociability & Silliness; Krish Ponamgi, Graduate and Professional Student Foundation Representative; Eddie Saxe, Secretary of Soda; Scott Shauf, Secretary of Sports; and Tom Hudson, Secretary of Surviving Stuff.

During summer 1994, the CSA organized a half-day tour of the Caterpillar wheel loader and backhoe plant in Clayton, N.C. Approximately 20 people, including faculty, students, friends, and family members, went on the tour and had a great time.

CSA held an all-student meeting and feedback forum where students met and discussed various issues, such as teaching, policies, etc., which arose during the fall 1994 semester. A full report was submitted to the Department chairman, Steve Weiss. As a result of this meeting, several actions were taken and committees were formed.

The CSA nominated Fred Brooks and James Anderson for the Provost's new Post-baccalaureate Teaching Award. Five awards are given annually.

With help from the CSA, students collected $1,000 to help Ernest Parker, computer systems administrator, who lost his house and belongings in a fire last fall.

The CSA sponsored a premier party for the first episode of "Star Trek Voyager." Participants watched the premier on the large projection screen TV in room 011 of Sitterson Hall while enjoying pizza and soft drinks. Watching "Voyager" in Sitterson has since become a weekly event.

The CSA "soda pool" is now new and improved! The new system uses plastic tokens (poker chips) instead of cash, which eliminates past theft problems.

CSA activities for spring 1995:

Ongoing from fall 1994: informal CSA dinner outings to local restaurants are being held nearly every week.

Work continues on the CSA home page on the World Wide Web. It will be accessible through the Department's home page and will offer a new twist on traditionally available CSA resources.

As an addition to the CSA home page, a committee is working on a professor/course feedback system. In this forum, students will be able to publicly, but anonymously, offer opinions about professors and courses. Students will be able to look up information by professor, class, or semester. The system will also provide facilities for faculty responses and comments.

A committee is working to put together a departmental research resource system which will serve as a central repository for information about research in the Department. Faculty members will be asked to submit brief descriptions of what they believe are interesting problems in their research area, along with a list of related classic papers and readings.

T-shirt contest

Five very creative entries were submitted in this year's T-shirt contest. Mark Mine designed the winning entry. Mine's design depicted the computer scientist as a toolsmith and incorporated a quote by Fred Brooks: ". . . a toolmaker succeeds as, and only as, the users of his tool succeed with his aid. However shining the blade, however jeweled the hilt, however perfect the heft, a sword is tested only by cutting. That sword-smith is successful whose clients die of old age." Mark wins a free T-shirt. Tom Hudson organized the contest.

Ultimate frisbee club

Mark Parris and other graduate students in the Department have helped launch UNC-Chapel Hill's Ultimate Frisbee club, a very active traveling club that has done very well in tournaments this year. This club grew out of the Department pickup games which once took take place on the lawn behind New West Hall. Current participants include Parris, Dave Luebke, Bill Mark, and Scott Randolph, graduate students, and Steve Molnar, research assistant professor. John Eyles, research assistant professor, is the club's faculty sponsor.

Congratulations to . . .

Fred Brooks, who was elected a Foreign Member of the Royal Academy of Engineering and a Distinguished Fellow of the British Computer Society (see separate article in this issue).

Katrina Coble, administrative assistant, Amy Kreiling, systems programmer, and Brian White, computer services manager, who recently graduated from the University Management Development Program through the Kenan- Flagler School of Business. The three attended a seven-week course which covered a wide variety of management topics, taught by the Executive Education faculty of the Business School. They were selected to participate in the program along with 52 other managers and professionals at UNC-Chapel Hill and five participants from N.C. Central University.

Jonathan Cohen, graduate student, who won the Video Countdown Contest, sponsored by the Graphics and Image Lab. Jonathan's entry was selected from among three excellent submissions; the others were from Arthur Gregory, undergraduate, and a joint entry from Dave Chen, graduate student, and Andrei State, senior research associate in graphics. Jonathan's video countdown featured 3D numbers that morph into each other. Each number is represented by building a 3D tube around a spline curve. The consecutive pairs of tubes are then morphed into each other while changing colors. Jonathan won a gift certificate to Il Palio Ristorante at the Siena Hotel in Chapel Hill.

Henry Fuchs, who was inducted as an ACM Fellow in March 1995.

John Halton, professor, who was awarded 60 hours of Cray Y-MP time by the NCSC Allocation Committee for his proposal, "Sequential Monte Carlo Techniques for the Solution of Large Linear and Non-linear Systems."

Dinesh Manocha, assistant professor, who was recently named an Alfred P. Sloan Research Fellow for 1995-97. David Plaisted, professor, who was invited to be a member of the editorial board of the Journal of Functional and Logic Programming, which is published electronically by MIT Press. Congratulations to him also for attaining 10 years of State service as of December 1994.

Brian White (M.S. 1987), who was promoted from systems programmer to computer services manager (this position replaces the director of Computer Services position formerly held by Bill Howell). Brian is responsible for the Department's computing and communications infrastructure and for managing the Computer Services staff. He began working for Computer Services as a research assistant in the spring of 1986. After receiving his degree, Brian worked for the Department as a Systems Programmer I. Prior to assuming his current position, he was promoted to Systems Programmer II and System Programmer/Administrator II.

And to our fall 1994 graduates

M.S.: Jeffrey Mauldin, Daniel Pratt, Srikanth Ramamurthy*, Michael Sharp, and Li Yue

*on to Ph.D. at UNC-Chapel Hill

Computer Services news

New Sun servers installed

During fall 1994, York Davis, systems programmer, and Frederic R. Jordan, electronic shop supervisor, installed five new Sun SPARC 20 servers. The machines replace and increase the disk space formerly provided by our aging Sun-4/280 servers purchased in 1989. Many special functions handled by the old servers are running on the new machines at a much faster rate.

The new servers are dual-processor computers. Each processor is about 15 times as fast as the Sun-4/280 processor. Disk, bus, and network interface speed are all significantly faster as well, which brings us into the 1990s in terms of server technology.

Three of the new Suns are set up as file servers. Baldhead is our new Sun platform compute server, replacing the Sun-4/280, Bodie. This machine has 128 MB of main memory and 1.7 GB of "playpen" space and is intended for compute-intensive jobs that require a Sun processor. The playpen space is not backed up and is provided for temporary storage of files needed by compute- intensive jobs and for other applications where a large amount of space is needed for a short period of time.

SGIs upgraded to IRIX 5.2

Amy Kreiling recently upgraded the operating systems on the Department's five SGI systems to Version 5.2 of the IRIX operating system. The upgrade was needed to provide support for various new features, to allow utilization of the new SGI binary file format, and to allow us to use the latest versions of third-party software for SGIs.

New public Macs installed

The Department purchased four new PowerMac 8110s (based on the PowerPC chip) this fall. Melanie Stecker (M.S. 1990), systems programmer, handled installation in public areas of Sitterson Hall. The machines are equipped with CD readers and audio-visual capabilities. Software packages installed include Adobe PhotoShop and Microsoft PowerPoint, in addition to utilities such as Telnet, Microsoft Word, and Microsoft Excel.

New HP file server installed

In fall 1994, Michael North installed a new HP 735 file server for the MSL. The new server, named Babbage, has 13 GB of disk space and 144 MB of main memory. The disk space will be used primarily for the PixelFlow project.

Network improvements

Ken Weaver, computer network manager, worked during fall 1994 to establish detailed documentation for the Sitterson network connections. This documentation is critical both for handling any problems that might occur with the network as well as for planning and implementing improvements to it.

After completing the documentation, Ken worked with the Infrastructure Subcommittee of the Departmental Facilities Committee (DFC) to upgrade our building network. Ken's network plan, which was well received by the DFC, consists of four sequential phases of replacement of our present communication equipment, while leaving the building's cabling largely intact.

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