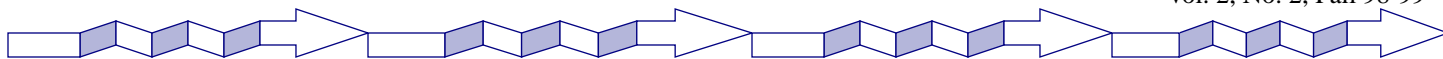


# LINKS

UNIVERSITY OF PITTSBURGH

Vol. 2, No. 2, Fall 98-99



## SCIENTIFIC COMPUTING

A new BS degree program in Scientific Computing was recently approved. The degree program is operated jointly by the Departments of Mathematics and Computer Science.

Modern science and engineering have become increasingly reliant upon computation as an aid to development, design, and research. Moreover, it has become clear that solving large-scale scientific and engineering problems usually requires knowledge that straddles several disciplines. In particular, such projects almost always are critically dependent upon some aspects of the mathematical and computational sciences. This includes, among others, a knowledge of mathematical modeling, state-of-the-art numerical analysis, symbolic and logic analysis, software development tools for high performance computer architectures and, especially, parallel and vector computers, graphical analysis, visualization, and networking.

There is a growing need for more people trained in this increasingly important, interdisciplinary field called *scientific computing* or *computational science*.

The basic major in Scientific Computing consists of at least 52 credits of courses in mathematics and computer science, and in addition, requires a minor in a related area of the physical or biological sciences, economics, or an approved area of engineering.

## SCHEDULING PROTOCOLS

Kirk Pruhs & Balasubramanian Kalyanasundaram

Our research project, sponsored by NSF, is investigating online scheduling problems that arise in processor scheduling and network communication applications. The dilemma in an online problem is that since the scheduler must make decisions without full information, e.g., when tasks will arrive in the future, one cannot hope to achieve optimal schedules. Thus we are seeking to identify algorithms that produce schedules that are competitive with some "standard" of performance, e.g., the optimal schedule. Our experience indicates that there is no "standard" that is the right choice for all problems. The "standard" must be selected after some understanding of the problem has been obtained.

The goal of our research is to develop new algorithmic design techniques for identifying algorithms that might work well in practice. Ultimately, any analysis technique must be judged by how well it achieves this goal.

To date we have focused our investigations on two general classes of scheduling problems that arise frequently in processor scheduling and network communication applications. The first class of problems involves minimizing the response time of a collection of jobs. For one processor, this is the standard CPU scheduling problem that can be found in almost all introductory operating systems text-



books. The second class of problems are real-time scheduling problems where jobs have deadlines, and possibly associated priorities or benefits. Here, you get different problems depending on whether the system is underloaded, slightly overloaded, or heavily overloaded. Applications for these problems arise in scheduling tasks, real-time operating systems such as RT-Mach, and scheduling communications in distributed multi-media networks.

One analysis technique we have developed is *resource augmentation*. This technique compares the performance of an online scheduling algorithm equipped with extra resources (e.g. faster processors, extra processors, or extra buffers) against the optimal scheduler without these extra resources. This offers the system designer a practical method (paying a little more for these resources) to ensure that the cost of nonclairvoyance is small. To date the results of our resource augmentation analyses have been promising. For

continued on page 4

## FORTY-TWO YEARS IN COMPUTING

Alfs Bertziss



*Professor Alfs Bertziss is retiring after 28 years in the Computer Science Department. We asked him to write a retrospective article.*

I wrote my first computer program in February, 1957 for CSIRAC, a clone of the Manchester Machine. I had been accepted as a graduate student in theoretical physics at the University of Melbourne in Australia, and the first requirement was to attend a programming course. Of course, programming was quite different from what it was even two or three years later. When "fast" memory consists of 768 20-bit words circulating as sound in tubes filled with mercury, and input is prepared by punching holes in a 2 inch wide paper tape, programming is not all joy. Still, computing had become so fascinating that I wanted to do more and more of it. A turning point came when I managed to talk the physics faculty into letting me introduce programming as a component of undergraduate lab work. Then, in 1964 the university started a department of computation, and this led to an invitation to join its faculty.

While spending the academic year 1967/68 at Pitt on a sabbatical, I was invited to join the Pitt faculty. I did so in September of 1970. At that time we had just an MS Program, but quite a lot of undergraduate courses were being offered. There were no textbooks, so a lot of time went into preparing course material, and people rarely had time to convert their course notes into textbooks. I was lucky in this respect. In addition to

teaching discrete mathematics and data structures, I was also teaching numerical analysis, for which texts existed. Hence I had the time to turn my notes for the former courses into a textbook. Another difference between now and then is that most undergraduate courses are now fairly stable, while in the earlier days they were going through rapid changes.

For quite a few years the faculty size of the Pitt computer science department remained at around 12, but we added a PhD program, and then a BS program. The BS program became very popular: in 1980 the first programming course was taught to about 2000 students, and we had around 800 declared or prospective majors. Course development had to keep pace, and most of us were creating new courses. Now our faculty is close to twice the size it was in the 1980s, the number of undergraduate majors has dropped, and the number of graduate students has sharply increased. This has allowed greater emphasis on research. Not only does this give greater visibility for the department, but our courses improve by being taught by faculty who have a very deep and confident understanding of the material.

Looking back, I consider myself fortunate to have witnessed the third major change in human history. After the agricultural and industrial revolutions, we are now nearing the end of an information revolution. I will not dwell on this change because I talk a lot about it in the book *Software Methods for Business Reengineering*. However, it cannot be emphasized too often that in the new era people will have to be much more flexible in their work. From personal experience, I know that it can be fun. Before switching to physics, I spent three years in an engineering school. My dissertation was essentially on numerical methods. Afterwards I was a mainstream computer scientist. Now my main interest is in software engineering, and I hope to keep it up for years to come. But who knows where my interests may shift? The main attraction of computing is that there are many more branches to follow than in any other field.

## PROMOTIONS

We are proud to report that three faculty members in the department were promoted from Associate Professors to Full Professors. The faculty members are Donald Chiarulli, Rajiv Gupta and Kurt VanLehn. Congratulations!

**Professor Donald M. Chiarulli** received his BS degree (Physics, 1976) from Louisiana State University, MSc (Computer Science, 1979) from Virginia Polytechnic Institute, and PhD (Computer Science, 1986) from Louisiana State University. He was an Instructor/Research Associate at LSU from 1979 to 1986, and has been at the University of Pittsburgh since 1986. His current research includes several projects concerned with the architecture, implementation, and application of scalable parallel processing systems.

**Professor Rajiv Gupta** received the BTech degree (Electrical Engineering, 1982) from the Indian Institute of Technology, New Delhi, India, and the PhD degree (Computer Science, 1987) from the University of Pittsburgh. He was a Senior Member of Research Staff at Philips Laboratories from 1987 to 1990 and a Visiting Professor in the Microcomputer Research Lab at Intel Corporation in 1996. Since 1990 he has been on the faculty of the Department of Computer Science at the University of Pittsburgh. His primary areas of research interest include optimizing and parallelizing compilers, static analysis techniques, tools for software debugging and testing, and superscalar architectures.

**Professor Kurt VanLehn** received a BS (Mathematics, 1974) from Stanford and a PhD (Computer Science, 1983) from MIT. He joined the University of Pittsburgh in 1990 as an Associate Professor of Computer Science and a Senior Scientist at the Learning Research and Development Center after four years as an Assistant Professor of Computer Science and Psychology at Carnegie-Mellon University. His research interests focus on applications of artificial intelligence to education and cognitive modeling.

# PATH AND RESOURCE SENSITIVE OPTIMIZATIONS

Rajiv Gupta & Mary Lou Soffa

Our research group in programming languages is currently involved in an NSF sponsored project on path and resource sensitive code optimization.

The current design for compilers includes code optimizations to provide the performance required in today's application programs. The extensive research performed on code optimization in the last 25 years has focused on developing the necessary data flow and code transformation algorithms for particular optimizations. Although these efforts have been enormously successful, a number of problems with the optimization models that are currently used are surfacing.

One problem relates to where optimizations are applied in the program code. The traditional approach is to analyze and apply code optimization uniformly over all parts of a program. Implicit in this formulation is the assumption that all paths through the program are equally important. However, a recent study shows that while programs contain large numbers of paths, a very small fraction of these paths are typically exercised during program execution. In the context of modern processors, it is appropriate to aggressively optimize frequently executed paths through the program even if this is achieved at the expense of a slowdown along infrequently executed paths. Another problem is that the optimization models that have traditionally been used are inflexible and simplistic in that they do not take into account the available machine resources or characteristics. The optimization algorithms typically are unaware of machine characteristics, such as support for predicated and speculative execution, which may influence the application of optimizations. They are also unaware of the impact of optimizations on resource pressure, such as demands for registers and functional unit resources.

The third problem in the application of optimizations is that the time or space demands of the optimizations cannot be controlled. This issue is particularly important when questions arise about the scalability and the effectiveness of these

techniques when applied to large programs. Indications from industry are that for large application programs, many of today's optimization techniques are too costly to apply. Both the time and memory costs of an optimization must be able to be limited in some way to handle large programs. This requirement dictates that "best effort" optimization algorithms must be designed which, given a limited amount of time and memory resources, focus their effort to yield the maximum optimization benefits.

In this research project, we are exploring and developing techniques that address these problems through the development of a framework for path and resource sensitive optimizations. The most beneficial paths of a program to optimize, machine characteristics, and available resources will be factors in the path and resource sensitive optimization algorithms.



Instead of simultaneously considering the optimization opportunities across the whole program, program paths will be the scope for optimizations. Path selection will be based on execution profiles and resource demand profiles for paths, as the most beneficial optimizations are those performed on paths that are frequently executed paths as long as the resources required by the optimized path are available. In order to apply the optimizations on paths, we will focus on demand driven analysis and optimization algorithms. By selectively generating demands for optimizations, we will be able to control compile-time costs as well as make the best use of available compile-time resources.

We plan to implement our algorithms and to experimentally evaluate their performance. Through the experimentation, our goal is to establish the tradeoffs between compile time and memory requirements versus code improvements and run-time performance.

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## HELPING COMPUTER SCIENCE

The Department of Computer Science is constantly endeavoring to meet the needs of both graduate and undergraduate students. Upgrades and expansions of computing lab facilities for students are ongoing activities. Also, scholarship funding to help defray the costs of students' educations, including their research, is always needed. We are currently trying to involve more undergraduates in research and to give them some experience in doing experimental work.

We have included a card and an envelope for any contribution that you might be able to make to help the Department meet some of our needs and achieve some of our goals. We will publish a list of our alumni who donate money to the Department in a future issue of LINKS. Your name will be included if you so wish. Thank you in advance for your help.

LINKS is published semi-annually by the Computer Science Department, University of Pittsburgh. Your suggestions, comments and contributions are welcome. Please send them to the address below.

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## CS CO-OP PROGRAM ENJOYS SUCCESS

A new cooperative program in computer science was introduced a year ago and has proved to be quite successful. Currently, we have nine students working on Co-ops with excellent organizations.

Through the assistance of the School of Engineering's Cooperative Education Office, formal arrangements are established with industry that permit students to rotate four-month terms between the workplace and the classroom. At the University of Pittsburgh, this rotation begins after the completion of the sophomore year and extends into the senior year, with the co-op student completing at least three four-month work periods. These employment sessions, which are typically with the same employer, allow job duties to increase as the knowledge and skills of the student progress.

By alternating between work and school, cooperative education provides the student with relevant work experience with local, national or international companies. Some of the benefits to the students include practical experience, technical knowledge, and a clearer understanding of the opportunities available in computer science. Additionally, thanks to the salaries that the students receive during a co-op cycle, many students can forgo part-time employment while on school rotation.

The participating companies also benefit in a number of ways, including using this program as an excellent recruiting tool. Companies use the programs as a cost-effective means of completing projects and adding talent to their work teams.

Companies participating so far include: Eaton/CutlerHammer, IBM Endicott, Goodyear, FMC Corporation, CIS / Univ. of Pgh., MEDRAD, INC., Smithkline Beecham and ABB, INC.

If your organization would like to sponsor a computer science co-op student, please contact Maureen Barcic at (412) 624-9882. It is a good way to help a student and get some work done.

## MY EXPERIENCE IN THE CO-OP PROGRAM Rene Duquesnoy

I began thinking about doing a co-op assignment in the fall of 1997. After submitting my application, I had a number of interviews with different companies. These interviews took many different forms including site visits, campus visits and phone interviews. After receiving a number of offers, I decided to do a co-op with Goodyear Tire and Rubber Co. I chose Goodyear for a number of reasons. First, I was told that I would be working in software development on an interesting project, which was my goal. Secondly, the working environment at Goodyear seemed very good. And finally, the salary offered was the highest!

Early January, I began my first assignment at Goodyear. I was assigned to the Pension Improvement Team (PIT). The purpose of the PIT team was to develop a new pension program for all of Goodyear's associates around the world. When I arrived for the co-op, I was immediately thrown into the thick of the project. The PIT crew consisted of Goodyear associates and consultants from Computer Sciences Corporation, Gap Gemini, IBM Global Services, and Forte software. The expertise of the people involved was diverse and included Oracle data base administrators, COBOL programmers, MQ series gurus, GUI designers, and Forte developers - and me, the co-op who never was in this type of environment before.

After a few days of getting passwords and access to the correct servers, I was told that I was going to a Forte application development class in Rockville, Maryland, and within the week I was there. In the class, I learned how to develop software using TOOL, Forte's object oriented programming language. The next week, I began developing applications. I started out slowly, because I didn't really know what was going on, and my supervisor didn't know how fast I could work. Once a few weeks went by, I was pushing out results like a seasoned veteran. Because of deadlines, the PIT team would sometimes have long hours of work, but they never asked me to stay after hours because they never needed to

ask. I was in the thick of things and felt that I should stay. The work was long and hard, and sometimes very frustrating, but it was also very rewarding. Working with people from such a variety of backgrounds gave me insight on the different types of job opportunities that are available in a computer science career. I got to see the pros and cons of each type of job, which is more than what a textbook or a company description could have taught me.

Needless to say, we passed all of our milestones with success and met our deadline, and then it was time to go back to school. Once back at the University of Pittsburgh, I began to miss the working environment. Fortunately, the summer went quickly, and my next assignment was right around the corner. I returned to Goodyear in the fall with my motivation intact and my expectations high. Because of the nature of the co-op, students are rotated between different departments to give the student a variety of experiences. My new department is the Electronic Commerce Department of North American Tire. This department works with Lotus Notes development and standards for Goodyear's Internet sites. Although I still am new to this department, there is a lot of potential here for me to do some valuable work, and I look forward to it.

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### Scheduling Protocols { continued from page 1 }

the one problem where there is a clear empirical champion, the classic uniprocessor CPU scheduling problem, resource augmentation analysis correctly identified the multi-level feedback algorithm used by the Unix operating system as the champion. For many of the other problems, our analysis has suggested simple algorithms that do not appear to have been considered in the literature before.

# ACCOLADES: 1998

## FACULTY

**Donald Chiarulli** was appointed subject area editor (Optical and Optoelectronic Computing) for the *Journal of Parallel and Distributed Systems*. He was also selected to serve on the program committee for the Conference on Advanced Optical Memories and Interfaces to Computer Systems II, Denver, July, 1999.

**Panos Chrysanthis** is a program committee member for the 1999 NSF Information and Data Management Workshop, UCLA, March 1999, the 15th IEEE Int'l Conference on Data Engineering, Sydney Australia, March 1999 and the IEEE International Workshop on Research Issues on Data Engineering: Virtual Enterprises, Sydney Australia, March 1999. He was also an invited participant to represent academia in the NSF Database Systems Industrial/Academic Workshop held in California in October.

**Martha Pollack** gave the Keynote Lecture at the Utrecht Artificial Intelligence Institute Colloquium in Utrecht, Holland, October 1998. She also gave an invited talk at ICMAS '98 (The 3rd International Conference on Multi-Agent Systems), Paris, France, July, 1998. She was appointed to serve as a senior program committee member for the area of Perception, (Re)action, Planning, and Scheduling for the 3rd International Conference on Autonomous Agents, and was appointed to serve as a program committee member for the 5th European Conference on Planning.

**Mary Lou Soffa** was recently elected to the ACM SIG Board Executive Committee as a member-at-large and will serve for two years. She was also invited to serve on the advisory board for Springer's new journal *Software Tools and Technology Transfer*. She served on the program committee of the Symposium on Static Analysis held in Piza in September, 1998.

**Kurt VanLehn** was invited to present his work on intelligent tutoring systems to a

committee from the National Academy of Science which is planning the future of assessment in America. The talk was October 2 at the NAS facility in Woods Hole, MA.

**Taieb Znati** was identified in a survey sent to students on the Oakland campus as a professor who made a significant and positive impact on the lives of students.

## GRADUATE STUDENTS

*Andrew Mellon Predoctoral Fellowship:*  
**Tarun Nakra** (99-2 & 99-3)

*The National Physical Science Consortium Fellowship:*  
**Colleen McCarthy** (1998-1999)

*The Taulbee Award:*  
**Jae Oh** (1998-1999)

## UNDERGRADUATE STUDENTS

*Pellegrini Award:*  
**Gloria Santin** (1998)

*Outstanding Scholastic Achievement Award:*  
**Gloria Santin** (1998)

*CAS scholarship Awardees:*  
**Christopher Grant** (99-1) and  
**Johnathan R. Speicher** (99-1)

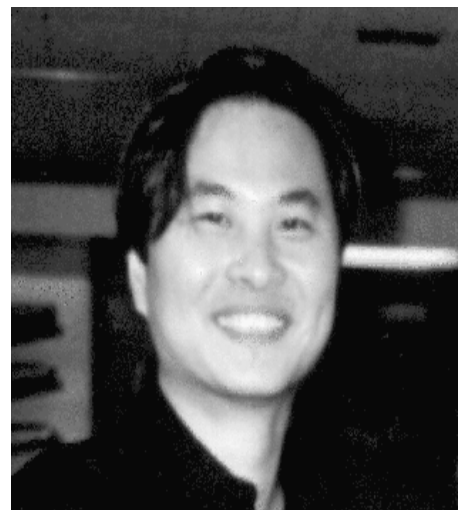
## TAULBEE AWARD FOR EXCELLENCE IN COMPUTER SCIENCE

This year's winner of the Taulbee Award is Jae Chan Oh. This award was initiated in October, 1989 in honor and memory of Orrin and Margaret Taulbee. Orrin Taulbee was the founder in 1966 of Pitt's Department of Computer Science, and he served as chair until 1984.

The criteria for judging the candidates for the annual Taulbee Award include: (1) being a full-time student in the Ph.D. program, with a high QPA, (2) having passed the Ph.D. preliminary exams and made significant progress toward the degree, (3) completed at least two semesters with classroom experience as a Teaching Assistant or Teaching Fellow, with evidence of outstanding teaching skills, (4) demonstrated strong research interests, as confirmed by the faculty advisor, and (5) shown a marked interest in pursuing an academic career.

The presentation of the award was made in September, 1998 at the Computer Science Department's get-together, which is held annually for purposes of welcoming new graduate students and faculty as well as honoring outstanding teaching performances among faculty and TAs/TFs. The award carries a prize of \$1,000.

Congratulations to Jae!



## AN INTERVIEW WITH BOB HOFFMAN

*Bob Hoffman has been on the technical staff in the Department of Computer Science for over 24 years. We thought it would be interesting to interview him, and the following is the result.*

### **When did you start to work at Pitt and how did it happen?**

My first Pitt experience was Freshman Orientation in the summer of 1973. I had been fooling around with radios and electronics since I was 9, so the first thing I sought out was the campus radio station. At that time, it was WPGH-AM, 640 KHz, carrier-current, with office and studios on the third floor of the student union. I started as a Freshman Electrical Engineering student in the fall of 1973. I spent most of my free time at the radio station.

The fall of 1974 found me back at Pitt continuing my EE education. In October of that year I learned that a Dr. Tom Dwyer in Computer Science was looking for someone to build electronic gadgets. I was hired for the job and spent the next two years working for Dr. Dwyer.

The project funding expired in December, 1976, after which I went to work in the Sleep and Motor Activity Lab at Western Psychiatric Institute and Clinic (WPIC). I graduated with my BSEE degree in April, 1977 and continued to work at WPIC until the end of February, 1980.

In 1980, Dr. Dwyer called me at WPIC and said that he had been funded with a new NSF grant and would I like to come back and work for him. He also asked if I would mind if he doubled my salary and had me promoted to Electronic Systems Design Engineer. How could I refuse?

I came back to the Department of Computer Science and the Solo/Net/Works project in March, 1980. At that time, Dr. Dwyer had only budgeted me as a 70% part-time position. I offered the other 30% back to WPIC to finish up some projects there but they were not interested. Dr. Taulbee, who was the department chair in the Computer Science Department, stepped in and funded the other 30% so that I could work on

various projects for other CS faculty. It was at this time that I started working with Unix in earnest.

### **Describe your job today.**

I manage the installation, configuration and maintenance of over 350 computers and two networks in two buildings. I set standards for the installation of operating systems and ensure that all security measures are implemented. In Alumni Hall, I perform most of the installation tasks myself. I modify software to be compatible with our AFS authentication scheme.

I also change the light bulbs in the computer room.

### **What did your job consist of 25 years ago?**

For Project Solo, my job was to build two generations of interfaces to the pipe organ. The first was a bank of solenoids that pressed the keys. This was driven by a 32-bit parallel port. The second was a bank of 128 power transistors driven by sixteen 8-bit parallel ports on an Intel 8080. This interface activated the valves at each pipe directly.

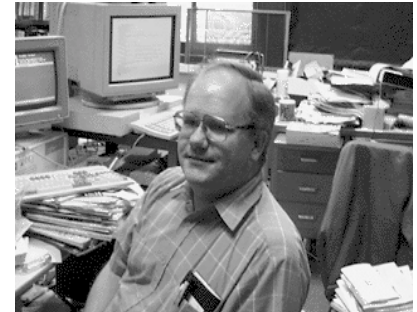
On the department side after 1980, I spent most of my time running RS-232 cables for terminals in people's offices and installing expansion hardware for our PDP-11/40 and PDP-11/45.

### **How has your job changed over these years?**

Well, I'm not running many RS-232 cables any more! We installed our first ethernet in 1982 and that same cable still serves some of this building. We went from having a star topology with RS-232 to a bus topology with coaxial ethernet, and now we're going back to a star with twisted-pair ethernet.

Also, I used to have time to "play." That's how I learned what I did about Unix system administration and C programming. There's no time for play now. I'd like to learn more about Oracle but I haven't had the time. I've installed three Oracle servers so far but have yet to use one.

### **Thinking back 25 years ago, what has happened in these 25 years that surprises you the most?**



I really shouldn't be surprised at it, but the density and cost of storage media is incredible. Back on the PDP-11/45, we had RK05 (2.5MB) and RP03 (40MB) disk drives. The RP03 was the size of a washing machine. I just upgraded my laptop with a 2.5-inch diameter 5.1GB drive. That drive, which fits easily into my shirt pocket, is the equivalent of 130 RP03s which would fill about half of the third floor of Alumni Hall, except that the building probably couldn't meet the power requirements. If you look at cost, the \$500 5.1GB drive cost \$125 in 1978 dollars. 130 RP03s with the appropriate number of controllers (17) would have cost \$2,801,960 in 1978, which equates to \$11,207,840 in 1998 dollars.

### **How does one prepare for your type of position today?**

A combined degree in electrical engineering and computer science would be a must. It helps to be a tinkerer and to spend considerable time learning how to fix things.

### **What is the hardest thing that you have to do today?**

Any type of intermittent problem, be it hardware or software, is the worst. If I can't reproduce the problem, I can't fix it.

### **Any predictions on where hardware/software will go in the next 25 years?**

That's easy! Hardware will get faster and cheaper and software will get bigger and more bloated and will fill all of the hard disk space that you can buy.

That's the down-side of having lots of cheap disk space and memory. Programmers just don't seem to be interested in efficiency. When all you had was a 64K PDP-11 or 8080, you HAD to be efficient.

# ALUMNI NEWS

## B.S. GRADUATES:

**Weizhen Shen Bao**, B.S., 1993 (e-mail: weizhen.bao@tdh.state.tx.us)

Weizhen is currently employed at the Texas Department of Health as a Programmer/Analyst in the Automation Data Service Department.

**Chris Cooper**, B.S., 1986 (e-mail: CoopPC@aol.com)

Chris is currently working for Northrop Grumman in Baltimore MD. His current assignment is to lead the development of the kernel functions for the next generation radar system. The architecture being used for this job is a massively parallel machine (32 CPU) with 4 gig of shared memory. The radar application falls into the category of hard real-time. One of the actions performed by the kernel is the scheduling or dispatching of threads or tasks.

**James A. Eiler Jr**, B.S., 1978 (e-mail: james.eiler@alcoa.com)

James is currently employed at the ALCOA Technical Center in Pittsburgh.

**Ray Fasnacht**, B.S., 1981 (e-mail: ray@airlink.com)

Ray is a Vice President and co-founder of AirLink Communications, Inc. AirLink develops software and test equipment for wireless communications. Ray's responsibilities include engineering, business development, marketing, and sales.

Ray and his wife, Sandy live in the "small" town of Pleasanton about 30 miles away from where he works in San Jose.

**Mercy M. Fung**, B.S., 1994 (e-mail: ngai@math.gatech.edu)

**Bill Nixon**, B.S., 1989 (e-mail: bnixon@computer.org)

Bill moved to Washington, DC after graduation in 1989 to take a position with American Management Systems, a business and information technology

consulting firm. In 1992, he took a position at Fannie Mae, the nation's largest source of home mortgage funds. He is currently Director of Server Engineering and responsible for the reliability of the UNIX client/server environment. He has kept in contact with many Pitt graduates via the Zets. Although Washington is a great place to live, he misses Pittsburgh, especially during hockey and football season.

**Christopher M. Powers**, B.S., 1992 (e-mail: cpowers@uss.com)

Christopher is currently employed by U.S. Steel in Pittsburgh as a systems designer.

**Jason Tsangaris**, B.S., 1992 (e-mail: lundo@telermal.com)

Jason is employed by PNC Bank in the MIS department.

## M.S. GRADUATES:

**Kishore Karnam**, M.S., 1994 (e-mail: kishore@basit.com)

Kishore joined NYNEX Science & Technology in White Plains, NY right after graduation. A few years ago NYNEX became Bell Atlantic.

Kishore is part of Network Systems Advanced Technology group at Bell Atlantic, focused on Telecom network service assurance. He is working on developing a test and analysis gateway for special services circuits including advanced digital circuits. Part of it is based on CORBA-based architecture. Currently, he is working on designing a generic object-based architecture for special services circuit test and analysis. It is also becoming a crucial system for competing long-distance service providers to access Bell Atlantic's local network.

## Ph.D. GRADUATES:

**Xin Yuan**, Ph.D., 1998 (e-mail: xyuan@cs.fsu.edu)

Xin is currently an Assistant Professor in the Department of Computer Science at the Florida State University.

**Jodi Tims**, Ph.D. 1998

Jodi will become the Chair of the Computer Science Department at St. Francis College in January, 1999.

**Mary Jean Harold**, Ph.D. 1988 (e-mail: harrold@cis.ohio-state.edu)

Mary Jean was recently tenured and promoted to associate professor at the Ohio State University. She was recently asked to be the program committee co-chair for the International Conference of Software Engineering in 2001.

**Lori Pollock**, Ph.D. 1986 (e-mail: pollock@cis.udel.edu)

Lori was recently tenured and promoted to associate professor in the Department of Computer Science at the University of Delaware.

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## CS STUDENT PLAYS PRO-BALL

Tom Barndt, a 1995 Pitt computer science graduate who earned Big East All-Scholar Athlete honors, has been the starting nose tackle for Kansas City Chiefs this year. Through the first nine games he has 47 tackles and 2.5 sacks. You may have noticed Tom in the exciting Monday night game against the Steelers where he registered a career-high 8 tackles.

The Chief's homepage (<http://www.kcchiefs.com>) calls Tom one of the most versatile performers on the Chiefs roster.

We would like to hear from you. Please update your address and tell us what you are currently doing. Also if you know the whereabouts of any CSD alumni please send us the person's name and address. You can use this form or send us e-mail.

**CONTRIBUTIONS TO THE CSD**

For information about contributions to help the Department of Computer Science please see the article on page 3. A card and envelope have been included with this issue of LINKS for your convenience.

Name\_\_\_\_\_

Address\_\_\_\_\_

Place of employment\_\_\_\_\_

Phone Number\_\_\_\_\_E-mail address\_\_\_\_\_

Information about yourself\_\_\_\_\_

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or send e-mail to [keena@cs.pitt.edu](mailto:keena@cs.pitt.edu)

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