

T h e U n i v e r s i t y o f K a n s a s

**Information and
Telecommunication
Technology Center**



Annual Report
Fiscal Year 2004

The ITTC Vision

To be a global leader in, and catalyst for,
the unification of computing, communication,
and sensor technologies
while being a strategic partner for their commercialization.

The ITTC Mission

- To create the fundamental knowledge and technologies required to realize the convergence of computing, communications, and sensors for the expansion of our economy and the improvement of the quality of life.
- To educate the next generation of technology leaders who will drive this convergence.
- To transfer to industry the knowledge and technology that will enable this convergence.



Our Focus is Your Future!

The Information and Telecommunication Technology Center (ITTC) is a KTEC Center of Excellence, funded in part by the Kansas Technology Enterprise Corporation. ITTC is a division of the University of Kansas, which is an entity of the State of Kansas separately managed and distinct from the Kansas Technology Enterprise Corporation.

On the Cover

The cover shows the interior dome of Nichols Hall, home of ITTC. The photo was taken by Betsy Schnorenberg, a past marketing and public relations manager of ITTC.

Built in 1971 in cooperation with the National Aeronautics and Space Administration (NASA), Nichols Hall is used to develop technologies and advance knowledge in the areas of information technology, telecommunications, radar systems and remote sensing.

The building is named for Raymond Nichols, KU chancellor from 1972 to 1973, in recognition of his promotion of significant research, educational, and service activities at KU.



Director's Welcome



We are excited to share with you changes and accomplishments at ITTC during FY2004. **Strategic initiatives and growth opportunities**, the themes of this *Annual Report*, continue to propel the Center in new directions. Both of these focal points converged during the restructuring of ITTC's laboratories.

We adjusted our thrust areas to correspond with the Center's expanding research initiatives. ITTC also established two new laboratories, the Bioinformatics and Computational Life-Sciences Laboratory (BCLSL) and the Computer Systems Design Laboratory (CSDL).

Understanding the importance of bioinformatics research, we have recruited qualified researchers to the University. In last year's annual report, we introduced **Xue-wen Chen** and his work with microarray data analysis. This year we are profiling **Terry Clark**, who comes to us from the University of Chicago. Clark brings an expertise in bioinformatics and computational biology with formal training in chemistry and computer science. At ITTC, his research includes the study of genomes, protein dynamics, data management, and high-performance computing.

This year's accomplishments highlight different parts of the ITTC mission. We extended the state of the art and developed technologies, receiving U.S. patents for our work. We also continue to educate the next generation of technology leaders. Our students receive national and University accolades, and our

alumni continue to have success in industry and academia.

The final prong of our mission is the transfer of knowledge and technologies to industry. The Center has developed several assistance policies for individuals or organizations interested in using ITTC resources. Bluetooth Special Interest Group (SIG), Inc., headquartered in Overland Park, Kan., sponsored research in the evaluation and development of Bluetooth technology. A defense contractor licensed an ITTC communication system developed for the "Polar Radar for Ice Sheet Measurements (PRISM)" project. The novel system allows for Internet communication in remote areas such as the polar ice sheets. ITTC technologies also provided the core for new companies, including Veatros and Cadstone. Veatros provides customized technical research solutions to help broadcasting media companies protect their property. Cadstone offers design tools to help electronics developers detect and correct design defects early in development. We will further showcase how ITTC fulfills its mission in the Projects section.

Thank you for your interest in ITTC.

Victor S. Frost

Director of ITTC

Dan F. Servey Distinguished Professor, EECS

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Fiscal Year 2004 Overview

"The countries that create the best environment for innovation will be the economic powers of tomorrow," says John Doerr, TechNet co-founder and partner at Kleiner Perkins Caufield & Byers. "Look at the last 10 years for evidence. High technology represented less than 10 percent of the overall U.S. economy, but the industry drove more than 25 percent of overall economic growth."

Silicon Valley/San Jose Business Journal, Wednesday, 3/09/05

Information Technology (IT) is an indispensable resource affecting every aspect of education, research, life sciences, business, health care, and everyday life. ITTC is positioned to become a significant contributor within the life sciences and bioinformatics arena furthering the economic growth of Kansas. Two years ago, ITTC identified the opportunities within bioinformatics as complementary to ITTC's mission and synergistic with many of our areas of expertise.

ITTC's research infrastructure has been acquired over the past 20 years and is world class. Averaging more than six million dollars per year in expenditures over the past four years (see bar chart, page 4), ITTC is the largest academic information technology (IT) research organization in the State.

ITTC continues to provide strong support for education and industry. Approximately 160 students are actively working within ITTC, enhancing their education while providing a valuable resource to ITTC and the State. In addition, today's students will be the industry leaders of tomorrow.

FY2004 Accomplishments

ITTC continues to be successful in partnering with local industry and other nationally recognized universities and agencies to obtain funds for key research projects in our core technology areas. ITTC had another exceptional year, having leveraged more than \$7.4 million in core R&D (non-MAMTC*) sponsored research. In addition, Nortel Networks donated to ITTC a DMS transport node OC-192 optical telecommunication data switch valued at \$750,000, which is not accounted for in the funding totals.

Including state, MAMTC*, federal, and industry sources, almost \$8.4 million in total support was secured for the year. In addition, FY2004 was another successful year in terms of the transfer of ITTC-developed technologies to companies. Activity for FY2004 yielded a new license, work with four start-up companies, several new patents, and technology transfer revenues of \$81,370.

**Mid-America Manufacturing Technology Center: KTEC funding for MAMTC is awarded through ITTC (\$87,354 in FY2004).*

Key ITTC Performance Indicators (not including KTEC & MAMTC funds)

Key Indicators	FY 2001 Actual	FY 2002 Actual	FY2003 Actual	FY2004 Actual
R/D&C Industry Funds Leveraged	\$ 660,584	\$ 685,656	\$132,834	\$ 576,334
R/D&C Federal Funds Leveraged	\$ 3,706,281	\$ 5,101,914	\$ 6,708,851	\$ 6,365,848
Total R/D&C Funds Leveraged	\$ 4,366,865	\$ 5,787,570	\$ 6,841,685	\$ 6,942,182
New Technologies Commercialized in KS	3	4	7	1
Licenses Awarded	5	5	3	1
License Fees/Royalties	\$ 139,757	\$ 172,215	\$ 67,212	\$ 81,370
New Companies Formed in KS	0	2	0	0

Throughout the last decade, ITTC has committed itself to the development and commercialization of technologies important to Kansas and its economy. ITTC continues its commercialization efforts and, in doing so, facilitates economic development in Kansas. To this end, ITTC has transferred twenty-seven technologies to companies for commercialization during the last five years.

ITTC continues to develop its internally funded commercialization efforts and support a number of local companies with their technology development efforts. FY2004 highlights include industry projects with the following Kansas companies:

- Anvil, Inc.
- Sprint
- Bluetooth SIG, Inc.
- Sunflower Broadband
- Cadstone, LLC
- Select Logic
- ECJC and LRTC
- Veatros, LLC

Strategic Plan Update

Several specific actions from our Strategic Plan have been taken. As laid out in the Plan, our growth is constrained by the number of principal investigators (PIs). So we have added one new research assistant professor in the past fiscal year and are in the process of hiring additional ones: **Ronald Sass** (see page 30) is new to ITTC beginning in August 2004. In addition, **Terry Clark** (see pages 1, 30, and 32), Professor of EECS, has joined ITTC as a PI as of August 2004.

In a continuing effort to maintain ITTC's focus upon current and evolving technology trends, we have established two new research laboratories: Bioinformatics and Computational Life Sciences Laboratory (BCLSL; see page 32), and Computer Systems Design Laboratory (CSDL; see page 33).

Additionally, and as recommended by our Industry Advisory Board, we have reevaluated and modified the thrust

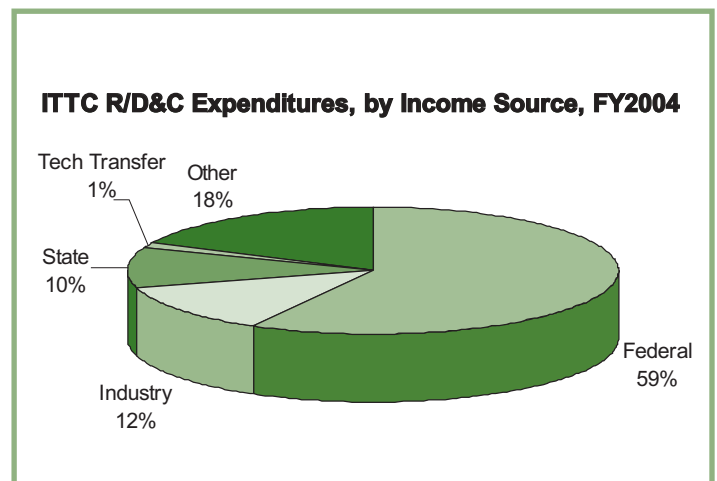
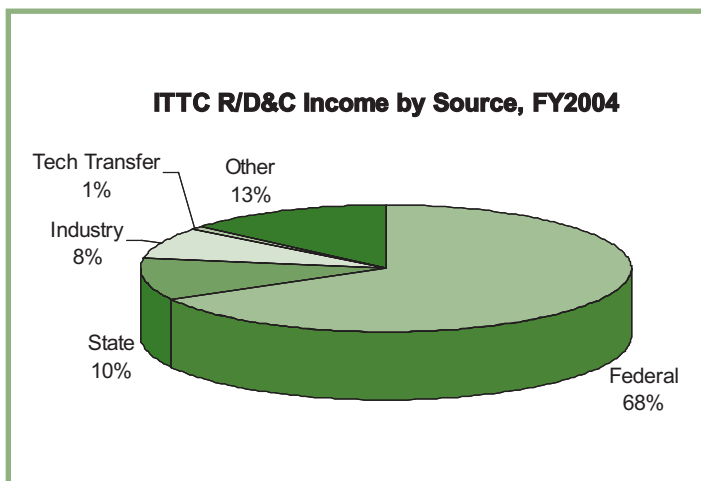
areas of three of our current laboratories to more closely reflect the focus of their work: Intelligent Systems Laboratory (ISL), Photonics Technology Laboratory (PTL), and Networking and Wireless Systems Laboratory (NWSL).

The initial work of reorganizing ITTC's laboratories is complete. With these refocused labs, ITTC is well positioned to face the challenges of the current research environment and capture new research opportunities. We will continue to align our thrust areas to respond to a changing environment.

Strategic Partnerships

In addition to those already mentioned in this report, we have maintained our strategic partnerships with local industry, while at the same time ITTC PIs have greatly expanded their collaborative efforts. Within the region, we have developed collaborations with the KU Medical Center, Higuchi Biosciences Center, KU's Molecular Graphics and Modeling Laboratory, KU's Department of Chemistry, Kansas State University (KSU), University of Missouri–Kansas City (UMKC), and Haskell Indian Nations University (HINU), to mention only a few. On a national/global scale, the NSF/NASA sensor web ITR effort, "PRISM" (page 7, and top of first column, page 37) includes University of Alaska–Fairbanks, NASA's Jet Propulsion Laboratory, The Ohio State University, the U.S. Army Cold Regions Research and Engineering Laboratory, the University of Chicago, the University of Copenhagen, the Alfred Wegener Institute (Germany), the University of Bristol (UK), the Antarctic Climate and Ecosystems Cooperative Research Centre (Australia), and the Phoang Institute of Technology (Korea).

ITTC continues to work with and support local technology organizations such as Lawrence Technology Association (LTA), the Enterprise Center of Johnson County (ECJC), the Lawrence Regional Technology Center (LRTC), and ITKC.



The ITTC Kansas City satellite office, located within ECJC, has proven to provide a valuable service to the Kansas City area and has helped expand the presence and awareness of ITTC throughout the region. These are only a few examples of strategic partnerships involving ITTC. (Please see a fuller list of ITTC's partners and collaborators, on page 31.)

FY2004 Progress Highlights

The following highlights from FY2004 reflect the variety and depth of ITTC's expertise and the increasing vigor of the Center's activities and progress.

ITTC pursued collaborative research opportunities within life-science and homeland security areas:

- Established an ITTC thrust area/laboratory in bioinformatics (see page 32).
- Developed a plan for technology-enhanced life-science research collaboration in Kansas City.
- Hosted a national workshop for DoE, Oak Ridge National Lab, for leaders working on SensorNet.
- Submitted a NSF ITR proposal on integrated methodologies for systems-level security modeling.
- Collaborated with KU's Higuchi Biosciences Center (HBC) on an internal proposal relating to neuroscience bioinformatics.

The Center continued to identify, develop, and act on targets of opportunities to achieve its long-term goals:

- Received a \$1.8 million NSF grant for work on radio frequency spectrum and new wireless tech-

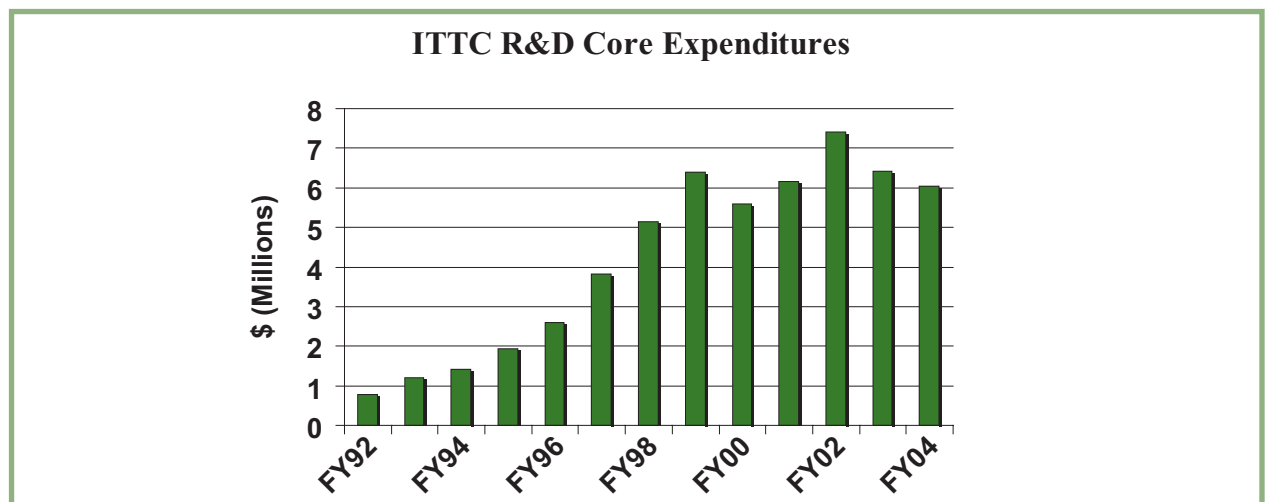
nologies—the “National Radio Network Research Testbed (NRNRT).” NRNRT will support research and development of new radio devices, services, and architectures and provide a facility for researchers to test and evaluate their systems.

- Continued to collaborate with Bluetooth Special Interest Group (SIG), based in Overland Park, on research related to Bluetooth devices—electronic devices that talk to each other at short range.
- Developed commercial-grade IT technologies and transferred technologies developed to Kansas industry: efforts have focused on relationships with Select Logic, Bluetooth SIG, Honeywell, and Anvil, Inc.
- Submitted to NSF—in conjunction with other research and academic departments from KU as the lead institution—a pre-proposal for an internationally collaborative “Center for Polar Research and Remote Sensing.” Out of 150 pre-proposals submitted to NSF for science and technology centers (STC), KU/ITTC's was one of 30 selected to submit a full proposal. If selected in the final round, the total project funding is expected to exceed \$25,000,000.00 with funding from NSF to be approximately \$20,000,000.

ITTC continued to pursue regional leadership in IT research and development:

- With ITKC, helped organize a talk on “The Off-Shoring of U.S. Jobs.”
- Hosted a visit by Federal Communications Commission (FCC) Chairman **Michael Powell** to ITTC in February 2004.

(Continued on page 44)



Strategic Initiatives and Growth Opportunities

During the past year, the Center has diligently pursued strategic initiatives and growth opportunities. After receiving an additional 7,125 square feet of space in Nichols Hall, ITTC formally expanded its areas of expertise and restructured its existing laboratories. The creation of the Bioinformatics and Computational Life-Sciences Laboratory (BCLSL) is part of ITTC's long-term plan for success. The addition of talented bioinformatics faculty, **Xue-wen Chen** and **Terry Clark**, will help build an important bioinformatics research foundation at the University of Kansas.

Chen's EPSCoR First Award in the summer of 2004 marked the first success for ITTC's new bioinformatics faculty. With this award, Chen continues his identification of informative genes for cancer classification.

Clark, our newest bioinformatics investigator, comes from the University of Chicago. He brings an established research program in computational methods and data management systems for biomolecular applications. Clark's collaborators include **Daphne Preuss**, a Howard Hughes Medical Institute investigator, and her group at the University of Chicago. Such an interdisciplinary alliance is an example of the types of relationships ITTC helps foster.

By providing the necessary facilities and resources, the Center nourishes life-sciences researchers and their work. In accordance with the first part of our three-fold mission, we are creating fundamental knowledge and technologies required to realize the convergence of computing, communications, and sensors to expand our economy and improve the quality of life.

Collaborators and funding sources within the State attest to the importance of bioinformatics. The Legislature passed the Kansas Economic Growth Act in 2004, approving \$500 million for life-sciences research and related economic development over the next 10 years. The University and Kansas City areas provide fertile opportunities for partnerships with life sciences, which is dependent on information technology to process, analyze, and present biological data in new, meaningful, and efficient ways.

The second part of our mission is to educate the next generation of technology leaders. We continue to do this and attract first-rate students to the Center. For example, Fulbright Fellow **Roque Gagliano** came to ITTC to work with **Ron Hui**, director of ITTC's Photonics Technology Laboratory (PTL). Hui's innovative work in fiber optics brought him and Gagliano together with the Department of Molecular Biosciences to develop optical biosensors. These sensors allow measurement of biomolecular interaction in real time and are an important tool in drug discovery and design.

Along with Fulbright Fellows, ITTC counts NSF, NASA, Self, and Sprint Fellows among its students. Students choose KU and ITTC for their breadth of activity and the opportunity to work with those conducting visionary research.

Gary Minden, director of ITTC's Networking and Wireless Systems Laboratory (NWSL), received a \$1.8 million NSF grant to find more available space on the radio frequency spectrum, use that space more efficiently, and evaluate new wireless technologies. Students working on the "National Radio Networking Research Testbed (NRNRT)" project will help pioneer solutions to the critical problem of limited spectrum space.

Faculty and students in the Radar Systems and Remote Sensing Laboratory (RSL) continue to produce radar designs at the forefront of international research. RSL has been involved with nearly every civilian radar system flown in space, and it contributes to the study of global climate change through such projects as the "Polar Radar for Ice Sheet Measurements (PRISM)" project.

The final prong of our mission is to transfer technologies from ITTC to industry. **Perry Alexander**, director of ITTC's Computer Systems Design Laboratory (CSDL), created the start-up company Cadstone to market the systems-level design language he developed. Cadstone is creating a suite of revolutionary design tools to help electronics developers detect and correct design defects early in the product development process.

In addition, ITTC is in the process of licensing a number of ITTC technologies, including RF Electronics Engineer **Dan DePardo's** patented wideband, planar receiving antenna. The antenna design provides a relatively inexpensive method of increasing the frequency range or bandwidth capability over that of more traditional patch antennas.

Susan Gauch, director of ITTC's Intelligent Systems Laboratory (ISL), has developed a conceptual search engine, which retrieves documents based upon a combination of keywords and conceptual matching. This is just the latest commercial enterprise for Gauch, who was the principal investigator on ProFusion and VitalSeek. Intelliseek, Inc., bought ProFusion in 2000, while Today Communications, Inc., sponsored research to develop the search engine Vitalseek.com in 2001.

As we have done in the past, ITTC faculty, staff, and students will cultivate each branch of our mission statement. We understand the interdependent nature of each part and that each must advance for the Center to thrive. ■

Technology Transfer

The vision of ITTC is to be a global leader for the unification of computing, communication, bioinformatics, and sensor technologies, while being a strategic partner and catalyst for the transfer of innovation. ITTC recognizes that innovation is of little value to society unless and until it is utilized by society. ITTC approaches innovation transfer as essential to our research mission by enabling society to realize the value of the Center's technologies. ITTC leverages its unique information technology research and development facilities in a continuous effort to use the ideas that flow from our research to bring value to our society and improve the Kansas economy. Throughout the last decade, ITTC has committed itself to the development and commercialization of technologies important to the economic development of Kansas.

ITTC continues to be recognized as a national leader in its areas of expertise. This was highlighted by Federal Communications Commission (FCC) Chairman **Michael Powell** when he noted, after visiting ITTC this year, that "Your team's work focuses on some of the most critical issues to the development of the next generation of spectrum-based services, and I commend the outstanding research you are doing to help make these services become a reality." Such recognition helps to confirm that ITTC is the State's

leading institution in information technology (IT) research, development, and commercialization.

Activities throughout FY2004 included the support of four start-up companies, two of which are based on ITTC-developed technologies, and the transfer of several technologies resulting from projects within ITTC. ITTC researchers were awarded three U.S. patents. (See "Patents," under "Faculty Achievements," page 18.) Additionally, two technologies are being commercialized in Kansas. ITTC has generated \$81,370 in technology transfer revenues during this fiscal year.

Each year, ITTC invests in a number of the most promising technology development projects and targets them for commercialization. ITTC approves new internal technology development projects only after a positive review by staff and Industry Advisory Board (IAB) members. These projects must have commercial potential and must be in areas of ITTC's technical expertise. In the past, such projects have led to spin-off companies and licensed technologies and have enhanced the Center's knowledge base, which is then applied to support other commercialization opportunities and Kansas companies. A number of these projects have matured to a point of commercialization and are being introduced to our industry partners.

Key Performance Indicators

Key Indicators	AUTM 2002 Data		ITTC (01-04)
	National Average	Top 25 Universities by Expenditures	
Research \$ to generate 1 License	\$8,807,234	\$8,636,874	\$1,861,164
Research \$ to generate 1 Lic. > \$1M	\$312,264,405	\$262,129,136	N/A
Research \$ to generate 1 Start-up	\$87,851,546	\$86,416,199	\$13,019,894
# Licenses per \$10M in Research	1.14	1.16	5.38
# Invention Disclosures per \$10M in Research	3.93	3.91	11.52
# Patent Filed Applications per \$10M in Research	3.28	3.49	4.61
# Patent Issued per \$10M in Research	0.95	1.00	3.07

Internal Commercialization Projects

Below is a partial list of the FY2004 internal commercialization projects.

- **Interactive Pointing Guide (IPG), or “Hover”:** A programmable software input device that can be loaded with application-dependent functionality for “Hover-aware” applications.
- **Intelligent AutoFill Form for XML:** Uses statistical techniques to automate the entry of data in XML forms based on the contents of other forms in the same domain.
- **Opto-Magnetic Polymer:** This will be an enabling technology to realize integrated optical isolators in optical transmitters and high-sensitive, magneto-optic sensors.
- **HDTV:** A wideband, planar receiving antenna that performs well under multi-path conditions.
- **Optical Domain Signal Analyzer:** Provides high-resolution and wide-bandwidth testing of optical signals.
- **Conceptual Search Engine:** A search engine that retrieves documents based upon a combination of keywords and conceptual matching.
- **Temporal Search for the World-Wide Web:** A system that queries a collection of Web pages relative to a specific time or time frame (i.e., tracks time-sensitive information).
- **ChatTrack:** An instant messaging archival technology. The technology will provide a real-time chat filter that forces safe chat procedures and an archive and classification system that allows for post-chat review.
- **Topic Tracking:** An automated system for identifying the topic of digital video from broadcast television and combining related video clips from other video sources, creating “topic summary.”
- **Rosetta Technologies:** An emerging systems-level design description language. The commercialization approach is the development of a Rosetta analysis environment, tools, and services.

PRISM Technology Commercialized

In 2001 NSF, NASA, and KTEC funded a large information technology research (ITR) project at ITTC: “ITR/SI+AP: A Mobile Sensor Web for Polar Ice Sheet Measurements” (also known as “Polar Radar for Ice Sheet Measurements,” or “PRISM”). The project’s total funding is \$8.7M. Significant accomplishments were made in the field related to radar sensors, communications, and robotics technology, as noted by **Pat Smith**, manager of technology development, National Science Foundation’s Office of Polar Programs:

“The group has been the first public group to experiment and successfully field a working prototype that takes single-channel Iridium links and bonds them into a larger link, thus providing greater data communications capability. . . . I am eagerly watching their progress as they are blazing a trail for what will become an important tool for general Arctic and Antarctic field research support.”

A commercialization success has materialized from the PRISM work. A government defense contractor became aware of the KU Iridium-based communications system and its abilities and has licensed the technology for a DoD application. ■

ITTC Industry Advisory Board

Nineteen members of ITTC's Industry Advisory Board (IAB) met with ITTC Executive Staff for the spring IAB meeting on May 25, 2004, at the Dole Institute of Politics. Seventeen IAB members are shown here: starting from the left, back row: John Strand, Victor Frost, Gunda Georg, Brian Ruf, Susan Norris, Mazen Mikha; middle row: Tim Johnson, David Nicol, Arcady Mushegian, Jim Roberts, Patrick Knorr, Bennett Griffin, Wayne Morgan; front row: George Wilson, John Lewis, Doug Hague, Gary Mastin, Stan Pierson, Ben Ewy. The photo was taken by Wally Emerson.



ITTC's Industry Advisory Board (IAB) members come from a variety of industries, research organizations, government agencies, and KU departments. Their input helps guide ITTC's activities and plans for the future. Following is a list of IAB members during Fiscal Year 2004:

Gary Alexander, Alexander Open Systems, Lenexa, Kan.
Phil Anderson, Alden McDuffie, Lawrence, Kan.
James Baxendale, KUMC Research Institute, Kansas City, Kan./KU Center for Research, Lawrence, Kan.
Gerard J. Canavan, CCT, Inc., Englewood, Colo.
Kevin Carr, Kansas Technology Enterprise Corp., Topeka, Kan.
Steve Chaddick, Ciena Corp., Linthicum Heights, Md.
Jim Dahmen, Columbus Telephone Co., Columbus, Kan.
William P. Duncan, Kansas City Area Life Sciences Institute, Kansas City, Mo.
Marc Epard, Netopia, Lawrence, Kan.
Benjamin J. Ewy, PNE Services, Olathe, Kan.
Jeff Fuller, Honeywell FM&T/KCP, Kansas City, Mo.
Gunda Georg, Medicinal Chemistry, University of Kansas, Lawrence, Kan.
Bennett Griffin, Griffin Technologies, Lawrence, Kan.
Douglas C. Hague, Sprint, Overland Park, Kan.
John Hansen, Cerner Corp., Kansas City, Mo.
James Isaacs, ITT Aerospace/Optical Div., Ft. Wayne, Ind.
Paul T. Kelly, Molecular Biosciences, University of Kansas, Lawrence, Kan.
Patrick Knorr, Sunflower Broadband, Lawrence, Kan.

Bob LaGarde, LaGarde Incorporated, Olathe, Kan.
John Lewis, Information Services, University of Kansas, Lawrence, Kan.
Tom Lyon, Lyon About, LLC, Palo Alto, Calif.
Gary Mastin, Lockheed Martin Integrated Systems and Solutions, Litchfield Park, Ariz.
Matt McClorey, Lawrence Regional Technology Center, Lawrence, Kan.
Mazen Mikha, Boeing Company, Wichita, Kan.
Wayne E. Morgan, Netchemia, Prairie Village, Kan.
Arcady Mushegian, Stowers Institute, Kansas City, Mo.
David Nicol, Overland Park, Kan.
Susan Norris, Norport Technology Management Consulting, Lenexa, Kan.
Maurice O'Sullivan, Nortel Broadband Networks, Ottawa, Ont., Canada
Stan Pierson, Aeroflex Test Solutions, Wichita, Kan.
James Roberts, KU Center for Research, Lawrence, Kan.
Brian Ruf, Ruf Strategic Solutions, Olathe, Kan.
Michael F. Sobek, Information Control Systems, Inc., Overland Park, Kan.
John Strand, Oak Ridge National Laboratory, Oak Ridge, Tenn.
Ben Vos, Sprint, Overland Park, Kan.
Gerald J. White, BV Solutions, Overland Park, Kan.
George Wilson, Chemistry/Pharmaceutical Chemistry, University of Kansas, Lawrence, Kan. ■

Labs Overview

During the fall of 2003, ITTC reorganized its laboratories. Evolving research and development activities led to changes and additions to the Center's areas of expertise. While continuing to specialize in information technology, telecommunications, radar systems and remote sensing, ITTC added bioinformatics and computational life-sciences research and computer systems design to its critical thrust areas.

More than 45 faculty and staff researchers and 160 students develop technologies that foster industry growth and often provide the core for new companies.

ITTC established the **Bioinformatics and Computational Life-Sciences Laboratory (BCLSL)**. Researchers use artificial intelligence to mine and analyze data from large-scale biological research projects, including gene expression and genome sequence data.

Perry Alexander's system-level design language Rosetta, and other embedded-systems research, drove the development of ITTC's second new lab. The **Computer Systems Design Laboratory (CSDL)** improves the design of computing systems ranging from small, embedded elements to large, distributed computing environments.

The Center combined its networking and wireless labs into the **Networking and Wireless Systems Laboratory (NWSL)**. **Gary Minden**, professor of EECS, directs the lab

that focuses on systems interconnected via radio and other technologies. NWSL researchers also improve the performance and protection of Internet-based systems.

Susan Gauch, professor of EECS, leads the **Intelligent Systems Laboratory (ISL)**, previously the Intelligent Systems and Information Management Laboratory directed by Costas Tsatsoulis. ISL continues to develop artificial intelligence, intelligent agents, information retrieval, data mining, and robotics.

The former Lightwave Communication Systems Laboratory is now the **Photonics Technology Laboratory (PTL)**, headed by **Ron Hui**, associate professor of EECS. The name change reflects the broader R&D focus, as photonics is an area of study that includes but is not limited to lightwave communications.

John Gauch, associate professor of EECS, and **Ed Meyen**, professor of special education, head the **e-Learning Design Laboratory (eDL)**. The lab continues studying and developing new learning environments and tools for online education.

The **Radar Systems and Remote Sensing Lab (RSL)** will remain under the direction of **Chris Allen**, professor of EECS. RSL has earned an international reputation and has been a fixture at KU since the 1960s. ■



Vernon Dempsey conducts research in ITTC's Photonics Technology Lab. Dempsey is a Haskell Indian Nations University student participating in the Research Initiative for Scientific Enhancement (RISE) program, which sponsors Haskell students in KU research labs.



Graduate student Kuyilmozhinangai Shanmugasundaram develops various parts of a radar system on a Compact PCI development platform in the Radar Systems and Remote Sensing Lab at ITTC.



NASA Fellow Vijaya Ramasami makes a circuit board using a PCV milling machine. Currently, Ramasami is one of three NASA Fellows at the Center.

Lab Details

Bioinformatics and Computational Life-Sciences Lab (BCLSL)

Interim Director: Victor Frost



The Bioinformatics and Computational Life-Sciences Laboratory (BCLSL) advances methods and tools geared to biological, biochemical, and medical applications. BCLSL investigators work with collaborators in the life sciences to identify, research, develop, and apply key computational approaches. These efforts directly involve the biological and medical domains in areas of modeling, analysis, and data management. In addition, concomitant research in traditional computational methods such as algorithm optimization, data- and compute-intensive methodologies, and statistical methods are pursued to meet the specialized needs of these problem domains. This interdisciplinary work in applied and basic research involves investigators from computer science, electrical engineering, mathematics, and life-science and medical disciplines.

Lab resources:

Artificial intelligence development tools and languages: Lisp, CLOS, CLIPS, Prolog, GBB, OPS, MEM-1

Computational clusters, reconfigurable floating-point gate arrays

Data mining tools: SNOB, Cobweb, ID3, C4.5, statistical analysis packages, LERS

Genomics Unified Schema installation

Information retrieval and Web tools: KUIR Information Retrieval Library

Parallel development tools including MPI, Pfortran, and PC Parallel GROMOS for molecular dynamics

Computer Systems Design Lab (CSDL)

Lab Director: W. Perry Alexander



The Computer Systems Design Laboratory (CSDL) focuses on the design, implementation and verification of systems whose primary components include computers. CSDL research addresses the design of computing systems ranging from small embedded elements to large distributed computing environments covering all aspects of the system lifecycle from requirements analysis through testing and validation.

Lab resources:

Hardware and software design experience:

- Development of Rosetta system-level specification language

- Real-time and distributed systems

- Embedded software and hardware systems

KU Real Time (KURT) Linux

Rosetta specification language

Raskell analysis environment

Protocols for ad hoc sensor networks

622 Mb/s ATM switch hardware

Network testing and measurement tools

Network simulation and modeling tools

Xilinx FPGA prototyping systems

e-Learning Design Lab (eDL)

Lab Directors: John Gauch, Ed Meyen



The e-Learning Design Laboratory (eDL) responds to the emerging challenges and opportunities in online education. eDL studies and develops new learning environments and tools for students of all ages. This includes the study, development, and research of new designs, principles, practices, and policies.

Lab resources:

Module creation tools

e-Learning instructional design

Authoring tools

Online assessment tools

e-Learning evaluation tools

Intelligent Systems Lab (ISL)

Lab Director: Susan Gauch



The Intelligent Systems Laboratory (ISL) advances knowledge in artificial intelligence, intelligent agents, information retrieval, data mining, and robotics. ISL is customizing IT services, creating smarter and user-friendlier environments and devices.

Lab resources:

Multiagent development tools:

ACCS, C++, CORBA, Java

Information retrieval and Web tools:

KUIR Information Retrieval Library, Php, XMLSpy, MySQL, Perl

Data Mining Tools:

SNOB, Cobweb, ID3, C4.5, statistical analysis packages

Artificial intelligence development tools and languages:

Lisp, CLOS, CLIPS, Prolog, GBB, OPS, MEM-1

Image processing and computer vision tools:

KUIM Image Processing Library, high-speed video, and data cable/fiber link

Human-intelligent system interaction tools:

Mobile robots, VR user interface, head-mounted display, force feedback joysticks

Networking and Wireless Systems Lab (NWSL)



The Networking and Wireless Systems Laboratory (NWSL) advances knowledge of systems interconnected via radio and other technologies as well as increasing the performance and protection of Internet based systems. NWSL also seeks to develop technologies to deliver reliable information to support end-user applications independent of the access technology.

Lab resources:

BONeS Designer, SPW

DSP rapid prototyping system

High-speed workstations

Logic analyzers

Network analyzers

Oscilloscopes and function generators

Prototype PC board fabrication tools

RF signal generators

Spectrum analyzers

Lab Director: Gary Minden

Variety of DSP platforms and evaluation tools

Extensive high-speed networking infrastructure: connected to high-speed, wide-area networks; Sprint testbed connection at 40 GB/s; Internet2, CAIRN testbeds for coast-to-coast experimentation; wide variety of routers, switches, and network interfaces

Hardware and software design experience: developed 622 Mb/s ATM switch hardware, network testing and measurement tools, network simulation and modeling tools, early Web applications and servers, integrated wireless mobile systems with fixed networks

Photonics Technology Lab (PTL)



The Photonics Technology Laboratory (PTL) explores new optical technologies and their applications in future optical communications and sensors. PTL is working to improve the capacity, flexibility and reliability of optical systems, which will make future photonics technology more efficient and cost effective.

Lab resources:

Optical spectrum analyzer

50GHz microwave network analyzer

40GHz digital oscilloscope

Tunable laser sources and optical filters

40Gb/s and 12 Gb/s BERTs

Lab Director: Ronqing Hui

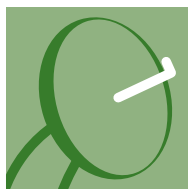
Electro-optic modulators, WDM multiplexers, demultiplexers

High-speed photodetectors

Commercial WDM systems at OC192 and OC48 data rates

360 km of fiber installed for systems-level testing

Radar Systems and Remote Sensing Lab (RSL)



The Radar Systems and Remote Sensing Laboratory (RSL) works on all aspects of microwave remote sensing of the earth, including oceans, ice, land, and atmosphere. RSL develops new radars along with associated antenna and signal processing technologies.

Lab resources:

Network analyzers (two 40 GHz, one 6 GHz, one 1.8 GHz)

RF signal synthesizers (two 20 GHz, one 2 GHz)

Spectrum analyzers (one at 50 GHz, one at 22 GHz, one 1.8 GHz)

High-speed oscilloscopes (one 50 GHz, one 20 GHz, two 1 GHz)

Frequency counter (one 26 GHz)

High-speed, digital bit-error-rate testers (one 40 Gb/s, one 10 Gb/s)

Direct digital, arbitrary waveform synthesizers (one with 2.4-GHz sampling frequency, one with 800-MHz sampling frequency, five with 200-MHz sampling frequencies)

Lab Director: Christopher Allen

Roof-mounted antenna measurement range (10 MHz to 20 GHz)

Indoor ground-penetrating radar test facility

Fiber-optic delay lines

Printed-circuit-board milling machine

Infrared soldering/rework station

Video-equipped inspection microscopes (one with 600x magnification, one with 60x)

Students in Strategic Research



Justin Rohrer

is a lifelong New Yorker who had originally intended to stay closer to home for graduate school, but a campus visit to the University of Kansas changed his mind. While at KU, Rohrer met ITTC investigators **Victor Frost**, **John Gauch**, **Ron Hui**, and **Gary Minden** and was impressed by the Center's faculty and research projects. ITTC faculty and staff were also impressed with Rohrer, who earned the ITTC Graduate Fellowship. Established in 2002, the award is designed to help recruit highly qualified individuals into doctoral research programs at KU. Rohrer will receive \$2,500 each year for the next two years.

Rohrer is planning to complete the required coursework for a master's degree as well as the Ph.D.

requirements at KU. He is looking forward to working with ITTC faculty and developing a strong network of contacts.

Rohrer is working with **Susan Gauch**, director of ITTC's Intelligent Systems Laboratory, on the "ChatTrack" project. ChatTrack provides a permanent record of chat room exchanges that can then be reviewed. The software's profile and retrieval mechanisms provide a new safety and security tool for parents, the government, and businesses.

Rohrer graduated in May with a bachelor's degree from Rensselaer Polytechnic Institute in Troy, NY. His major was electrical engineering, with concentrations in microelectronics and networking and a minor in economics.



Jared Fire

is conducting microarray data analysis in ITTC's Bioinformatics and Computational Life-Sciences Laboratory (BCLSL). Fire's advisor, **Xue-wen Chen**, assistant professor of EECS, gives Fire data generated from microarray experiments, which identify active genes within a cell and help identify mutated genes.

Fire writes code to run a computational algorithm that identifies feature (gene) selection. The ITTC researchers then classify several genes that might be associated with one another.

Fire is also learning to code the classification of genes, which will tell researchers whether genes are

healthy or cancerous. Cancers modify genes that control cell division, causing cells to replicate abnormally and form tumors.

Fire, from the Cheyenne Arapaho tribe, started working at ITTC through Haskell Indian Nations University's 500 Nations Bridge Program. In part, the Bridge program helps American Indian students who are seeking undergraduate degrees in biomedical sciences. Haskell does not offer degrees in these areas. The Bridge program works to create a smooth transition for students by sending them to KU to take mandatory classes and gain laboratory experience. Students can then transfer to KU, as Fire has done, to complete their degrees.



Rory Petty and Ted Weidling

built a 3-D viewing environment known as GeoWall, at ITTC, for KU's School of Engineering Expo in February 2004. The senior computer engineering majors spent 80 hours developing different lens configurations and alignments, setting up hardware, and creating content for the presentation. A GeoWall is a combination of software and devices that project a 3-D image onto a computer or movie screen. The GeoWall concept and effort originated from a consortium of universities, federal agencies, and other research entities "to broaden the use of scientific visualization tools for Earth



Science research and education by the use of low cost virtual reality visualization devices" including "new projection technology, fast graphics cards and inexpensive computers" (from the GeoWall Web site, <http://geowall.geo.lsa.umich.edu/>).

Advances in technology are enabling designers to use off-the-shelf parts and build a GeoWall for under \$15,000. GeoWall's previous price tag was between \$150,000 and \$1.5 million. The reduction in cost will allow more high school and university classrooms access to 3-D viewing, helping students learn a variety of sciences, including geology and meteorology.

Petty and Weidling are working with interested KU groups to allow the groups to use GeoWall for research or other academic pursuits. Petty says that computer graphics and computer vision classes have been particularly interested.

Petty and Weidling are also part of the "National Radio Networking Research Testbed" project and have been writing software to collect and analyze data about regional spectrum usage. This will help researchers present policy recommendations on spectrum usage to the Federal Communications Commission (FCC) and other regulatory bodies. It will also help Petty and Weidling test next-generation wireless technologies being developed at ITTC.

Petty is president and Weidling is vice president of the KU chapter of IEEE. Weidling is also president of the KU chapter of Eta Kappa Nu, the national electrical and computer engineering honor society. Both Kansas natives plan on attending graduate school.



Seniors Rory Petty and Ted Weidling built GeoWall for the School of Engineering's annual Engineering Expo. The projectors, which needed special lens configurations and alignments, sit on the ledge above the computers. The computers house the content for the 3-D presentation, including a view of downtown Lawrence.



Garrin Kimmell

is a Ph.D. student working on the system-level design language Rosetta. Designers of complex electronic systems, such as computers, must develop individual pieces while making sure they are complementary to the other parts of the system. Different vocabulary and engineering

processes make communication between different parts difficult. Rosetta, a system-level design language, allows these subsystems to interact with one another.

Kimmell has spent the last three years working on the Rosetta project. Kimmell's efforts, along with those of other ITTC researchers under the guidance of **Perry Alexander**, director of ITTC's Computer Systems Design Laboratory (CSDL), are leading to the standardization of

Rosetta. This standardization, which will allow most computer-based systems to use Rosetta, will be a significant stepping stone to the language's success.

Currently, Kimmell is helping develop tools for the analysis of Rosetta models. Embedded systems often have operating constraints not found in traditional computer systems, that make it necessary to limit power consumption. Kimmell works with power-aware modeling, which will help system designers specify the functional behavior of a system, along with the power consumption constraints that system may have. The designer will use Rosetta tools to explore the tradeoffs of various design decisions that include consideration of power consumption.

This is one particular application of Rosetta. The overall goal of the language is to independently model different facets (power, functionality, etc.) of a system.

Kimmell hopes to graduate in May 2006 and would like to stay in academia following graduation. ■

Executive Staff



Victor S. Frost

Director

Dan F. Servey Distinguished Professor, EECS

Victor Frost has performed research for many corporations, including Sprint, NCR, BNR, NEC, Telesat Canada, AT&T, McDonnell Douglas, DEC, and COMDISCO Systems. He has been principal investigator on 31 research projects and has published more than 100 journal and conference articles. Frost has served as a guest editor for the *IEEE Communications Magazine* and *IEEE Journal on Selected Areas in Communications*. He is currently an area editor for *ACM Transactions on Simulation and Modeling of Computer Systems*.

Frost's research interests are in the areas of network quality of service, integrated communication networks,

and high-speed networks; they have included projects such as MAGIC and AAI high-speed, wide-area testbeds.

He is a Fellow of the IEEE and received the Presidential Young Investigator Award from NSF in 1984.

Frost has served on State of Kansas NSF EPSCoR and DoD DEPSCoR committees, as well as the Kansas Inc. Telecommunications Task Force. He has made four presentations to committees of the Kansas Legislature. He is a member of the Board of Trustees for KU's Center for Research, Inc., and a member of the Board of the Lawrence Technology Association.



Tim W. Johnson

Executive Director

Tim Johnson has more than 20 years of industry and university experience in managing, researching, developing, transferring, and commercializing engineering and software technologies.

Since 1996, Johnson has served as executive director for ITTC. He has helped develop policies and procedures and managed the operational, technology transfer, commercialization and selected applied-research activities of ITTC.

Since 1982, Johnson has worked in a variety of industry and university concerns, including Kansas Power and Light; Kansas State University; Computer Sciences Corporation in Falls Church, Va.; and the University of Wyoming in Laramie, Wyo. In 1991, Johnson joined the Center for Excellence in Computer-Aided Systems Engineering (CECASE) at KU; in December 1996, he assisted with the formation of ITTC.

Johnson is active in regional organizations supporting information technology, technology transfer, and economic development. He has served on the Kansas Innovation

Center's Advisory Board and Operations Committee, Silicon Prairie Technology Association's Information Technology Committee, and Kansas Technology Enterprise Corporation's Telecommunications Committee and Information Technology Committee.

Johnson is a founding and board member of the Lawrence Technology Association and a founding and steering committee member of Kansas City's information technology support organization ITKC. His research, technology transfer, and commercialization activities have resulted in more than 35 presentations and technical publications. He is a member of the Association of University Technology Managers and an IEEE member whose professional memberships have included the IEEE Communications Society, Signal Processing Society, Computer Society, and Engineering Management Society.

Johnson received his bachelor's degree from Memphis State University in 1982, and his master's in 1985, with continued doctorate studies, while attending Kansas State University—all in electrical engineering.



Keith B. Braman

Associate Director for Technology Transfer

Keith Braman manages ITTC's technology transfer, intellectual property, and state-affiliated economic development activities. He received a juris doctorate from Washburn University and B.S. and M.E. degrees in aerospace engineering from KU.

Before joining ITTC in 2000, he was a senior manager of information systems and regulatory affairs for the Kansas Department of Social and Rehabilitative Services-Division of Health Care Policy. He has been vice president of operations and general counsel for KVA Product Development Group, LLC, in Topeka, which provided engineering consulting services for the design and manufacture of medical devices. Prior to working for KVA, Braman practiced law as a solo practitioner for several years, focusing on criminal, intellectual property, and corporate transactional law. He also has worked for McDonnell Douglas

Helicopter Co. as a flight controls engineer and technical area chief of flight dynamics. As a serial entrepreneur, and in addition to operating his own law office, Braman has worked as an engineering consultant in the area of flight-test research, software development, computer-aided design, and program management and has held founding positions in construction, real estate, and retail companies.

Braman is a member of the Kansas and Nevada state bars, the American Bar Association, the American Intellectual Property Law Association, and the Association of University Technology Managers (AUTM) in addition to being a member of the engineering honor society Sigma Gamma Tau. ■

Technical Staff



Torry Akins

Research Associate

Torry Akins is helping to develop the sensors needed for the "Polar Radar for Ice Sheet Measurements (PRISM)" project. He is also the principal investigator on an ITTC project, "Cryospheric Advanced Sensor (CAS)", sponsored by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology. He received his B.S. and M.S. degrees in electrical engineering from the

University of Kansas in 1996 and 1998, respectively. After earning his master's, he left to join the Radar Science and Engineering section of JPL, where he worked on the development of a space-qualified, real-time data processor. He returned to ITTC and the Radar Systems and Remote Sensing Laboratory (RSL) during the summer of 2002.



Brett Becker

Network Specialist

As a network specialist and system administrator, Brett Becker is responsible for the design, operations, and installation of the Center-wide server infrastructure and network. Becker has been involved in wireless network visualization research, which aims to inform

the public of security issues inherent in current wireless networking technologies. Becker is also a graduate student at KU, working toward his master's degree in EECS.*

*Note: Becker completed his research and defended his M.S. thesis in December 2004, before publication of this Annual Report.



Marilyn Cozad

Software Engineer

Marilyn Cozad supports technology transfer projects and currently is the Center's Webmaster. She focuses on applied technology projects involving the development of Web database applications using Web technology integrated with relational database management systems (RDBMS). She received bachelor's degrees in

accounting and in computer information systems, both from Washburn University of Topeka. Cozad, a certified public accountant, was a manager in a public accounting firm for more than 12 years prior to completing her computer information systems (CIS) degree.



Daniel DePardo

Research Engineer

Dan DePardo supports the Networking and Wireless Systems Lab and other Center electronic hardware needs. His areas of expertise include microstrip antenna design, surface acoustic wave (SAW) delay line and filter design, photolithography techniques, cleanroom procedures, hybrid circuitry design, environmental testing techniques, Mil-spec soldering and assembly, radio frequency interference (RFI) and electro-magnetic interference (EMI) suppression techniques, along with radio frequency and microwave components, circuitry, and systems in general.

His current efforts include NSF-sponsored development of frequency-agile orthogonal frequency domain multiplexing (OFDM) transceivers, spectrum mapping, and wideband wireless systems. DePardo recently received a U.S. patent for a wideband planar antenna design. Using the patented technology, certain flat-panel antenna designs can achieve unusually wide RF bandwidth characteristics.



Adam Hock

Senior Systems Administrator, Bioinformatics

Adam Hock is the new senior systems administrator for the Integrated Bioinformatics Information Infrastructure. He will be in charge of system integration, administration, and maintenance for the computer cluster being built as well as the development of new software

tools. Hock has worked for five years as a system administrator. Before joining ITTC, Hock was an engineer at Atipa Technologies, a provider of information technology solutions based on the Linux computer operating system.



Michael Hulet

Senior Systems Administrator

Michael Hulet is the senior network administrator for ITTC. He provides advanced computer hardware, software, and network support for the operational and research needs of the Center. Hulet joined ITTC as a computer systems administrator in 1998. He has a bachelor's degree in electrical and electronics engineering from

North Dakota State University and a master's degree in systems management from the University of Southern California. He was employed as an electronics engineer for the Naval Warfare Assessment Division in Norco, Calif., before joining ITTC.



David Johnson

Systems Administrator, Bioinformatics

David Johnson is the new systems administrator for the Integrated Bioinformatics Information Infrastructure. Johnson's duties include administering the bioinformatics database and software and developing

new bioinformatics tools. He is finishing his thesis for his master's degree in computer science from the University of Oklahoma.



Ed Komp

Research Engineer

Ed Komp has more than 15 years' experience in designing, implementing, and managing commercial software products. His primary interests include specialized computer language design for application-specific domains, functional programming, software development environments, and networking. He joined the Center in 1998. He received his B.A. in mathematics and his M.S. in

computer science from KU in 1976 and 1979, respectively. He was the primary software architect for the Block Oriented System Simulator (BOSS) and helped found a local company to commercialize this tool. He also was the primary software architect and manager for the Block Oriented Network Simulator (BONeS), a second commercial product success.



Danico Lee

Lead Software Engineer

Danico Lee joined ITTC in 1998 as an undergraduate research assistant. She received her B.S. in computer science and M.S. in computer science at KU in 1999 and 2002, respectively. She became a full-time software engineer with ITTC in 2002, where she is now a lead software engineer. Her areas of expertise include 3-tier systems engi-

neering, object-orientated software design, relational database modeling, and Web application development. She is working on projects related to KTEC technology development, commercialization, and technology transfer. She also meets with Kansas companies and provides technical assistance.



Leon Searl

Software Research Engineer

Leon Searl works on multiple projects as a software engineer at ITTC. He is working on the "National Radio Networking Research Testbed (NRNRT)" project and consulting on the "KU Technology Evaluation Satellite (KUTESat)" project. Searl worked at TISL (Telecommunications and Information Sciences Lab, a prede-

cessor of ITTC) while he was an electrical engineering student. Before returning to KU, Searl worked with TRW Space and Defense Group and Cadence Design Systems. He owned his own ultralight aircraft company. He received his B.S. and M.S. degrees from KU in 1985 and 1987, respectively.



Dennis Sundermeyer

Electronics Technician

Dennis Sundermeyer joined ITTC in January 2003 as the Electronics Technician for the "Polar Radar for Ice Sheet Measurements (PRISM)" project. He brings more than 25 years of experience in electronics to the project. He is helping ITTC students with their designs for

PRISM radar, especially the mechanical portions. Sundermeyer has traveled to Greenland the last two summers with the PRISM team to assist in the radar's testing. ■

Faculty Achievements

Once again, in Fiscal Year 2004, ITTC-affiliated faculty made noteworthy achievements and received recognition and praise from KU and national/international organizations.

Patents

Chris Allen, director of ITTC's Radar Systems and Remote Sensing Laboratory (RSL), and his colleagues have developed a technique for distinguishing polarization-mode dispersion (PMD) events from conventional network impairments. The data corruption known as PMD occurs in high-speed fiber-optic networks, and the dynamic nature of PMD makes it a particularly challenging problem for network engineers to deal with. Allen's **Method and Apparatus to Compensate Polarization Mode Dispersion** has received a U.S. patent and will help companies assess the new complexities that emerge with ever-increasing data transmission rates.

Ron Hui, director of ITTC's Photonics Technology Lab (PTL), has refined a technology that could aid in the improvement of optical bandwidth development. Hui recently received a U.S. patent for his design of an **Optical Spectral Analyzer (OSA)**. Hui's design provides up to 100 times greater resolution than current smaller analyzers. The resolution of the small, field-deployable OSA equals that of larger laboratory analyzers. The increased efficiency and additional bandwidth will cost a fraction of what it would cost to install and maintain new or extra fiber-optic facilities.

Swapan Chakrabarti, an investigator with ITTC's Bioinformatics and Computational Life-Sciences Lab (BCLSL), received a U.S. patent for the **True 3-D (T3D) system**. The technology allows everything from medical images to video games to display depth,

height, and width. Viewers will not have to wear any special glasses or headgear to see the 3-D images. ITTC researchers are developing both software and hardware that will give objects a sense of depth. The T3D system being developed will sell for \$15,000–\$20,000, while other 3-D systems cost nearly \$100,000. Chakrabarti and his team are using mostly off-the-shelf components, which greatly reduces costs.

Awards

Arvin Agah, with ITTC's Radar Systems and Remote Sensing Lab (RSL), received a **KU Center for Teaching Excellence Teaching Award for Computer Engineering** in May 2004. The Center, established in 1997, continues to improve teaching effectiveness and student learning in both traditional and innovative ways.

Perry Alexander, director of ITTC's Computer Systems Design Laboratory (CSDL), earned an **ASEE Midwest Region Dean's Award for Teaching Excellence** in 2003. Founded in 1893, the American Society for Engineering Education is a nonprofit organization committed to furthering education in engineering and engineering technology.

Alexander garnered a **W.T. Kemper Fellowship for Teaching Excellence** in August 2003. The Kemper Fellowships recognize the University's outstanding teachers and advisers with a \$5,000 monetary award. The award comes from a \$500,000 fund established by the William T. Kemper Foundation, with matching funds from the Endowment Association.

Bozenna Pasik-Duncan, an investigator with ITTC's Networking and Wireless Systems Lab (NWSL), accepted the 14th Annual **Louise Hay Award for Contributions to Mathematics Education** from the Association of Women in Mathematics in January 2004. The award cited Pasik-Duncan's broad and inspiring vision of mathematics as a discipline and profession. The annual presentation of the Hay award by this organization with international membership highlights the importance of mathematics education and evokes the memory of Hay, who was a chair of the Department of Mathematics, Statistics, and Computer Science at the University of Illinois at Chicago.

Pasik-Duncan also earned an **Outstanding Educator Award** from the KU branch of the Mortar Board National Honor Society in November 2003. KU Mortar Board members nominated educators for their devotion to academia, teaching style, accessibility, knowledge of their subject, and other special qualities identified by the KU Mortar Board Chapter.

Xue-wen Chen, with ITTC's BCLSL and Intelligent Systems Lab (ISL), obtained an **Experimental Program to Stimulate Competitive Research (EPSCoR) First Award**. The First Award was created to help faculty begin research programs early in their careers. With this award, Chen will continue to identify informative genes for cancer classification. He is developing computer algorithms based on mathematical/statistical models to analyze the biological data.

Chen also recently received **IEEE senior membership** status.

(Continued on page 30)

ITTC Research Investigators

Arvin Agah

Associate Professor, EECS

Research Interests:

- Autonomous mobile robots for harsh environments
- Biomedical robotics
- Distributed robotics
- Multi-agent systems
- Software engineering



Education:

Ph.D., Computer Science, University of Southern California, 1994
M.S., Biomedical Engineering, University of Southern California, 1993
M.S., Computer Science, Purdue University, 1988
B.A., Computer Science, University of Texas, 1986

Teaches robotics, artificial intelligence, intelligent agents, software engineering, computer systems design.

Honors and Awards include the KU EECS Cerner Teaching Award, June 2004; KU Center for Teaching Excellence Celebration of Teaching Award, May 2004; KU Henry E. Gould Award for Outstanding Teaching, 2000; KU Miller Faculty Development Award*, June 2001; Engineering Expo 2001 Educator Award, February 2001.

W. Perry Alexander

Associate Professor, EECS

Research Interests:

- Formal specification, synthesis, and verification
- Systems-level design
- Systems-level description languages
- System architectures
- Component retrieval



Education:

Ph.D., Electrical Engineering, University of Kansas, 1992
M.S., Electrical Engineering, University of Kansas, 1988
B.S., Electrical Engineering, University of Kansas, 1986
B.S., Computer Science, University of Kansas, 1986

Teaches software engineering, digital systems design, programming language paradigms, formal methods and modeling in software and hardware systems development.

Honors and Awards include Kemper Teaching Fellow, 2003; ASEE Midwestern Region Dean's Award for Teaching Excellence, 2003; KU Miller Faculty Development Award*, 2002–2003; Harry Talley Teaching Award, KU EECS Department, 2002; Center for Teaching Excellence Honoree, 2002; KU Engineering Expo EECS Department Teaching Award, 2000; Senior Member of IEEE; University of Cincinnati (UC) College of Engineering Neil A. Wandmacher Teaching Award, 1998; UC Electrical and Computer Engineering and Computer Science (ECECS) HKN Professor of the Year, 1992–1993, 1996–1997; UC Engineering Tribunal Professor of the Quarter, winter 1994, fall 1998; UC ECECS Department Teaching Award, 1996–1997; UC ECECS Department Research Award, 1993–1994.

Christopher Allen

John and Winifred Sharp
Professor, EECS

Research Interests:

- Microwave remote sensing
- Radar design and analysis
- Synthetic-aperture radar
- High-speed digital circuits and applications
- Fiber-optic communication systems
- Photonic systems and devices



Education:

Ph.D., Electrical Engineering, University of Kansas, 1984
M.S., Electrical Engineering, University of Kansas, 1982
B.S., Electrical Engineering, University of Kansas, 1980

Teaches circuits, electronic circuits, senior design laboratory, fiber optic communication systems, high-speed digital circuit design, microwave remote sensing.

Honors and Awards include Eta Kappa Nu; Phi Kappa Phi; Tau Beta Pi; Sharp Teaching Professorship, 2002–2005; KU Miller Faculty Development Award*, 2001; W.T. Kemper Fellowship Award for Excellence in Teaching, 2001; Ned N. Fleming Trust Award for Excellence in Teaching, 2001; KU Miller Professional Development Award for Research, 1999; KU EECS Harry Talley Excellence in Teaching Award, 1998; Center for Teaching Excellence honoree, 1998.

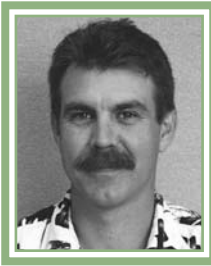
* Miller awards are presented through the KU School of Engineering. Recipients of the Miller Faculty Development Award are known as Miller Scholars.

David L. Andrews

Associate Professor, EECS

Research Interests:

- Computer architecture
- Distributed and parallel systems
- Embedded and real-time systems



Education:

Ph.D., Computer Science, Syracuse University, 1992
Computer Engineer Degree, Syracuse University, 1990
M.S., Electrical Engineering, University of Missouri-Columbia, 1984
B.S., Electrical Engineering, University of Missouri-Columbia, 1983

Teaches digital design, computer architecture, compilers, operating systems.

Honors and Awards include Senior Member of IEEE, 2001; *Who's Who in Science and Technology*, 2001; Outstanding Service Award, Electrical Engineering, University of Arkansas, 1996–1997; Outstanding Researcher Award, Electrical Engineering, University of Arkansas, 1995; General Managers Award, General Electric Co., 1990.

Ronald J. Aust

Associate Professor,
Teaching and Leadership

Research Interests:

- Designing and developing—
- Multi-state educational networks (including UNITE system and Explorer database)
 - Network technologies to support collaborative learning and community publishing of educational resources



Education:

Ph.D., Curriculum and Instruction, University of Washington, 1984
M.S., Education, Western Washington University, 1979
B.S., Education, Western Washington University, 1975

Teaches designing multimedia learning environments and instructional design.

David A. Braaten

Associate Professor of
Atmospheric Science,
Department of Geography

Research Interests:

- Snow accumulation
- Ice-sheet processes
- Remote sensing



Education:

Ph.D., Atmospheric Science, University of California-Davis, 1988
M.S., Meteorology, San Jose State University, 1981
B.S., Meteorology, State University of New York, 1977

Teaches introduction to meteorology, dynamic meteorology, advanced dynamic meteorology.

Honors and Awards include the Antarctic Service Medal, National Science Foundation and Department of the Navy, 1995.

Swapan Chakrabarti

Associate Professor, EECS

Research Interests:

- Designing hardware and software for True 3-D display systems
- High-speed computation of mathematical functions using analog neural networks
- Digital signal processing



Education:

Ph.D., Electrical Engineering, University of Nebraska-Lincoln, 1986
M.S., Computational Physics, University of Nebraska-Lincoln, 1982
M.S., Physics and Electronics, Calcutta University, India, 1976
B.S., Physics, Calcutta University, India, 1976

Teaches digital logic design, algorithmic problem solving, microcomputer applications, computer architecture, graphics in engineering research, computer vision, digital signal processing (including adaptive systems, neural networks, fuzzy systems).

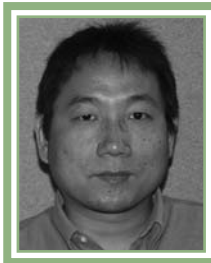
Honors and Awards include honorary member, Golden Key National Honor Society, 1996; KU Ned N. Fleming Teaching Award for Outstanding Classroom Teaching, 1992.

Xue-wen Chen

Associate Professor, EECS

Research Interests:

- Bioinformatics
- Machine learning
- Statistical modeling
- Data mining
- Human-computer interaction



Education:

Ph.D., Electrical and Computer Engineering, Carnegie Mellon University, 2001
M.S., Opto-electronics, Sichuan University, 1992
B.S., Physics, Sichuan University, 1986

Teaches bioinformatics, computer science.

Honors and Awards include Senior Member IEEE, 2004.

Muhammad Dawood

Research Assistant Professor

Research Interests:

- Radar and remote sensing systems
- Antennas
- Signal processing
- Adaptive algorithms



Education:

Ph.D., Electrical Engineering, University of Nebraska-Lincoln, 2002
M.S., Electrical Engineering, University of Nebraska-Lincoln, 1998
B.E. (Avionics), NED University of Engineering and Technology, Karachi, Pakistan, 1985

Honors and Awards include (all at UNL) First Prize, graduate student paper competition, 1999; Best Project Award, undergraduate research project, 1985; Best Performance Award, Radar Technology diploma course, 1980.

Daniel Deavours

Research Assistant Professor

Research Interests:

- Performance and dependability evaluation
- Markov models and numerical methods
- Discrete-event simulation
- Modeling languages
- Data-flow architectures
- Reconfigurable computing machines



Education:

Ph.D., Electrical Engineering, University of Illinois at Urbana-Champaign, 2001
M.S., Electrical Engineering, University of Illinois at Urbana-Champaign, 1997
B.S., Computer Engineering, University of Illinois at Urbana-Champaign, 1994

Kenneth Demarest

Professor, EECS

Research Interests:

- Lightwave communication systems
- Electromagnetic theory
- Antennas



Education:

Ph.D., Electrical Engineering, The Ohio State University, 1980
M.S., Electrical Engineering, The Ohio State University, 1976
B.S., Electrical Engineering, John Brown University, 1974

Teaches circuits, fiber optic engineering, electromagnetics, microwave systems, noise reduction in electrical systems, antennas, radar engineering, laser engineering.

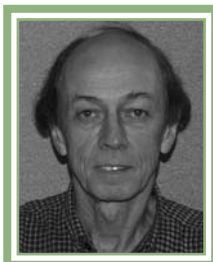
Honors and Awards include Eta Kappa Nu.

Tyrone Duncan

Professor, Mathematics

Research Interests:

- Stochastic adaptive control
- Stochastic optimal control
- Mathematics of finance
- Stochastic analysis
- Telecommunications
- Mathematics education



Education:

Ph.D., Electrical Engineering, Stanford University, 1967
M.S., Electrical Engineering, Stanford University, 1964
B.E.E., Electrical Engineering, Rensselaer Polytechnic Institute, 1963

Teaches stochastic analysis and its applications, stochastics of mathematical finance, stochastic control, stochastic adaptive control, fractional Brownian motion and its applications,

probability theory.

Honors and Awards include IEEE Fellow, 1999; KU Olin K. Petefish Award in the Basic Sciences, 1999.

Joseph B. Evans

Professor, EECS

Research Interests:

- Mobile networking and wireless systems
- High-performance networks
- Pervasive computing systems
- System implementations



Education:

Ph.D., Electrical Engineering, Princeton University, 1989
M.S., Electrical Engineering, Princeton University, 1986
M.S., Engineering, Princeton University, 1984
B.S., Electrical Engineering, Lafayette College, 1983

Teaches networking implementation, DSP implementation, computer systems design, integrated circuit design, electronics, programming.

Honors and Awards include Eta Kappa Nu; Tau Beta Pi; KU Spahr professorship, 2000–2003; KU Miller Professional Development Award for Research, 1996; AT&T Bell Laboratories Ph.D. Scholarship, 1984–1988; Garden State Graduate Fellowship, 1983–1987.

Currently on a two-year leave from ITTC to serve as a Program Director in the Computer and Information Science and Engineering Directorate at the National Science Foundation.

Victor S. Frost

Dan F. Servey Distinguished Professor, EECS Director, ITTC

Research Interests:

- Internet traffic management and quality of service
- High-performance networks
- Network measurement, modeling, control, and simulation



Education:

Ph.D., Electrical Engineering, University of Kansas, 1982
M.S., Electrical Engineering, University of Kansas, 1978
B.S., Electrical Engineering, University of Kansas, 1977

Teaches communication networks and systems.

Honors and Awards include KU Miller Faculty Development Award, 2002; Dan F. Servey Distinguished Professor of Electrical Engineering and Computer Science, 1996; IEEE Fellow, 1998; National Science Foundation Presidential Young Investigator Award, 1984; KU Miller Professional Development Award for Service, 1991; KU Miller Professional Development Award for Research, 1986.

John M. Gauch

Associate Professor, EECS

Research Interests:

- Digital image processing (segmentation, enhancement)
- Computer vision (stereo, motion tracking)
- Multimedia processing



Education:

Ph.D., Computer Science, University of North Carolina at Chapel Hill, 1989
M.S., Computer Science, Queen's University at Kingston, Canada, 1982
B.S., Computer Science, Queen's University at Kingston, Canada, 1981

Teaches algorithmic problem solving, structured programming, computer vision, image processing, computer graphics, digital image processing, multimedia systems.

Honors and Awards include KU Bellows Scholar, 2002; Archie and Nancy Dykes Award for Undergraduate Teaching and Mentoring, 2001; KU Miller Faculty Development Award, 2000, 2003; KU Bellows Scholar, 1999.

Susan E. Gauch

Professor, EECS

Research Interests:

- Multimedia databases
- Intelligent search agents
- Information discovery on the World Wide Web
- Corpus linguistics



Education:

Ph.D., Computer Science, University of North Carolina at Chapel Hill, 1990
M.S., Computer Science, Queen's University at Kingston, Canada, 1982
B.S., Mathematics and Computer Science, Queen's University at Kingston, Canada, 1981

Teaches programming, information retrieval, database systems, software engineering.

Honors and Awards include KU Miller Faculty Development Award, 1999–2000, 2003; KU Miller Professional Development Award for Research, 1998; Office of Naval Research Fellowship, 1988; QU N.E. Dupuis Prize in Mathematics, 1978.

Prasad Gogineni

Deane E. Ackers

Distinguished Professor,
EECS

Research Interests:

- Radar systems
- RF and microwave engineering
- Radar remote sensing
- Microwave radiometers



Education:

Ph.D., Electrical Engineering, University of Kansas, 1984
M.S., Engineering, Kerala University, Trivandrum, India, 1976
B.E., Mysore University, India, 1973

Teaches radar systems, microwave engineering, Electromagnetics II, senior design lab, electronics design lab, and others as required.

Honors and Awards include Fulbright Scholar, 2002; Louise E. Byrd Graduate Educator Award, 2002; KU Miller Faculty Development Award, 2002; NASA Group Award to Antarctic Mapping Mission, 2000; KU Miller Professional Development Award for Service, 2000; IEEE Fellow, 1999; NASA Terra Award, 1998; Best-of-Session Award from the Third International Airborne Remote Sensing Conference, 1997; KU Miller Professional Development Award for Research, 1991; Taylor and Francis Best Letter Award, 1991.

Jerzy Grzymala-Busse

Professor, EECS

Research Interests:

- Knowledge discovery
- Data mining
- Machine learning
- Expert systems
- Reasoning under uncertainty
- Rough set theory



Education:

Doctor Habilitatus, Engineering, Technical University of Warsaw, Poland, 1972
Ph.D., Engineering, Technical University of Poznan, Poland, 1969
M.S., Mathematics, University of Wroclaw, Poland, 1967
M.S., Electrical Engineering, Technical University of Poznan, Poland, 1964

Teaches data mining, expert systems, knowledge acquisition, artificial intelligence, concurrency models, Petri nets, data structures, computer architecture and networking, computer organization, theory of computing, switching theory, automata theory, computability, discrete structures, and probabilistic analysis.

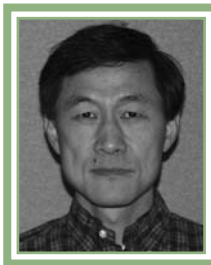
Honors and Awards include KU Miller Faculty Development Award, 2002.

Ronqing Hui

Associate Professor, EECS

Research Interests:

- Fiber-optic communications
- Photonic devices
- Optical sensors



Education:

Ph.D., Electronics Engineering, Politecnico di Torino, Torino, Italy, 1993
M.S., Lightwave Technology, Beijing University of Posts and Telecommunications, Beijing, China, 1988
B.S., Microwave Communications, Beijing University of Posts and Telecommunications, Beijing, China, 1982

Teaches fiber-optic communication systems and networks, optical measurements, microelectronic circuits, semiconductor materials and devices, general electric circuits.

Honors and Awards include KU Miller Professional Development Award for Research, 2002.

Jeremiah James

Assistant Professor, EECS

Research Interests:

- Distributed systems
- Concurrent objects
- Data consistency
- Distributed-system models
- Reproducing concurrent executions
- Real-time and embedded systems



Education:

Ph.D., Computer Science, University of California at Santa Barbara, 2000
M.S., Computer Science, Brigham Young University, 1993
B.S., Computer Science, Brigham Young University, 1992

Teaches advanced operating systems, concurrent systems, programming.

Honors and Awards include UCSB Computer Science Department Travel Scholarship, 1995–1996, 1998; UC Trustee's Fellowship, 1993–1997; NSF Fellowship, Honorable Mention, 1993; Phi Kappa Phi National Honor Society, 1991; Golden Key National Honor Society, 1990.

Pannirselvam Kanagaratnam

Research Assistant Professor

Research Interests:

- Radar systems
- RF and microwave engineering
- Radar remote sensing
- Geophysical signal processing



Education:

Ph.D., Electrical Engineering, University of Kansas, 2002
M.S., Electrical Engineering, University of Kansas, 1995
B.S., Electrical Engineering, University of Kansas, 1993

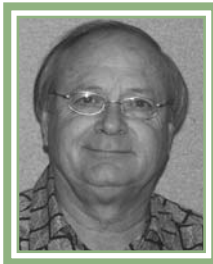
Honors and Awards include the Dorothy Haglund Prize for Outstanding Doctoral Dissertation, 2003; Honors for Ph.D. dissertation, July 2002; NASA Fellow, 1998–2001; Honors for Master's thesis, December 1995; Dean's Honor Roll, fall 1992.

Ed Meyen

Professor, Special Education

Research Interests:

- Online instructional design
- Web-based instructional tools
- Intellectual property issues
- Online instructional applications for students with disabilities
- Emerging instructional technologies



Education:

Ph.D., University of Iowa, Education, 1968
M.A., University of Northern Colorado, Special Education, 1959
B.A., University of Northern Colorado, Education, 1958

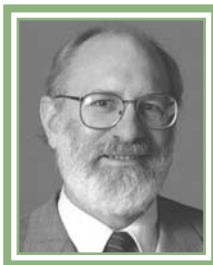
Teaches curriculum design, instructional design, instructional technology, graduate seminars.

Gary J. Minden

Professor, EECS

Research Interests:

- Large-scale systems, including
- Wide-area distributed systems
 - Mobile communication systems
 - Adaptive computational systems
 - Active networking



Education:

Ph.D., Electrical Engineering, University of Kansas, 1982
B.S., Electrical Engineering, University of Kansas, 1973

Teaches introduction to digital logic design, information security, active networking.

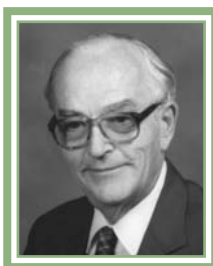
Honors and Awards include KU Miller Professional Development Award for Service, 2002; KU Miller Faculty Development Award, 1999, 2000.

Richard K. Moore

Distinguished Professor
Emeritus, EECS

Research Interests:

- Radar systems
- Radar remote sensing
- Radio wave propagation
- Radar oceanography
- Microwave radiometers



Education:

Ph.D., Electrical Engineering, Cornell University, 1951
B.S., Electrical Engineering, Washington University, 1943

Teaching Duties: Advises graduate students.

Honors and Awards include Australia Prize (for remote sensing), 1995; Italian Center for Remote Sensing Award, 1995; Fellow AAAS, 1993; National Academy of Engineering, 1989; KU Irvin Youngberg Award in the Applied Sciences, 1989; KU Louise E. Byrd Graduate Educator Award, 1984; IEEE Centennial Award, 1984; IEEE Geoscience and Remote Sensing Society Distinguished Achievement Award, 1982; IEEE Council on Oceanic Engineering Outstanding Technical Achievement Award, 1978; Alumni Achievement Award, School of Engineering and Applied Science, Washington University, 1978; Life Fellow IEEE (Fellow in 1962).

R. Douglas Niehaus

Assistant Professor, EECS

Research Interests:

- Real-time and embedded systems
- System and network performance evaluation
- High-performance simulation of computer systems and networks
- Concurrent and distributed programming tools and environments



Education:

Ph.D., Computer Science, University of Massachusetts at Amherst, 1994
M.S., Computer, Information and Control Engineering, University of Michigan, 1981
B.S., Computer Science, Northwestern University, 1980

Teaches introduction to operating systems, advanced operating systems, real-time and embedded system implementation, concurrent and distributed systems.

Bozenna Pasik-Duncan

Professor, Mathematics

Research Interests:

- Identification and adaptive control of stochastic systems
- Science, engineering, and mathematics education for K–12
- Stochastic analysis and its applications to finance, manufacturing, biomedicine, and telecommunications



Education:

Doctor Habilitatus, Mathematics, Warsaw School of Economics, 1986
Ph.D., Mathematics, Warsaw School of Economics, 1978
M.S., Mathematics, Warsaw University, 1970

Teaches probability theory, stochastic processes, mathematical statistics, stochastic modeling, stochastic adaptive control, calculus, stochastic calculus, differential equations, randomness in the modern world.

Honors and Awards include Louise Hay Award, Association of Women in Mathematics, 2004; KU Honor for an Outstanding Progressive Educator (HOPE) Award, 2003; Mortar Board Outstanding Educator Award, 2003; Frank B. Morrison Teaching Award, 2002; IEEE Fellow, 2001; IEEE Control Systems Society Distinguished Member Award, 2000; IEEE Third Millennium Medal for Outstanding Achievements and Contributions, 2000; Leader, China Control Systems Delegation, 2000; Tau Beta Pi; G. Baley Price Award for Excellence in Teaching, 1999; Kemper Fellowship for Teaching Excellence and Advising in Public Outreach, 1996; NSF Career Advancement Award, 1991–1993; International Research Experience (IREX) Fellowship to the United States (Berkeley, Harvard, MIT), 1982; Ministry of Higher Education and Sciences Award for Excellence in Teaching and Research, Poland, 1975; several Chancellor's Awards for research and teaching, Warsaw School of Economics, Poland, 1977–1978.

David W. Petr

Professor and Associate Chair for Undergraduate Studies, EECS

Research Interests:

- Traffic and congestion management for communications networks
- Traffic integration and quality of service (QoS) for wireless and wireline networks
- Performance analysis and simulation
- Evaluation of students' confidence in answers



Education:

Ph.D., Electrical Engineering, University of Kansas, 1990
M.S., Electrical Engineering, Stanford University, 1978
B.S., Electrical Engineering, Southern Methodist University, 1976

Teaches integrated telecommunication networks, analysis of communication networks, random signal theory, optimization with communication applications, introduction to communication systems, signal analysis, circuits.

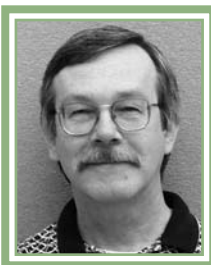
Honors and Awards include EECS Harry Talley Excellence in Teaching Award, 2003; Ben Dasher Best Paper Award for the ASEE/IEEE Frontiers in Education conference, October 2000; KU School of Engineering Sharp Teaching Professorship, 2000–2002; Visiting Erskine Fellowship, University of Canterbury, New Zealand, 2000; Excellence in Teaching Award, KU Center for Teaching Excellence, 1999; Member of Sigma Xi, 1992; Senior Member of IEEE, 1991; KU nominee for NSF Presidential Faculty Fellow, 1991.

Glenn Prescott

Professor, EECS

Research Interests:

- Software radio systems
- Spread spectrum and military communication systems
- Radio and radar signal processing
- DSP applications of field-programmable gate arrays
- Design and implementation of wireless communication systems



Education:

Ph.D., Electrical Engineering, Georgia Institute of Technology, 1984
M.S., Electrical Engineering, University of Missouri, 1976
B.S., Electrical Engineering, Georgia Institute of Technology, 1974

Teaches linear systems, electronics design laboratory, senior design laboratory, digital signal processing, digital communications, DSP for communications and radar, advanced modulation and coding.

Honors and Awards include NASA Special Service Award, 2000; KU School of Engineering Sharp Teaching Professorship, 1998–2001; NASA Terra Award, 2000.

James Roberts

Professor, EECS;

Vice Provost for Research

Research Interests:

- Wireless communication systems
- CDMA and spread spectrum systems
- Coding and information theory



Education:

Ph.D., Electrical Engineering, Santa Clara University, 1979
M.S., Electrical Engineering, Massachusetts Institute of Technology, 1968
B.S., Electrical Engineering, University of Kansas, 1966

Teaches wireless communication systems, information theory, and communication system planning and design.

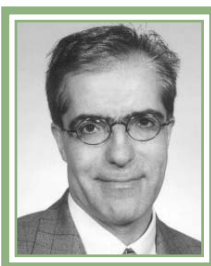
Honors and Awards include appointment to Board of Kansas BIO, Inc., Joint Steering Committee for the Ft. Leavenworth/KU Partnership, 2004; Chair, Douglas County Commission ECO2 (Ecology/Economic Development) Committee (appointed by Douglas County Commission), 2003; Member, Economic Development Board of Lawrence and Douglas County (appointed by Douglas County and Lawrence City Commissions), 2003; IEEE Fellow, 2002; Tau Beta Pi; Eta Kappa Nu; Sigma Xi; *American Men and Women of Science*; *Who's Who in Science and Technology*; *Who's Who in the Midwest*; Federal Government Distinguished Station Award (team award), 1987.

Hossein Saiedian

Professor and Associate Chair, EECS

Research Interests:

- Software engineering, including
- Software process improvement
 - Formalism in software development
 - Object-oriented software development
 - Software engineering education
 - Software architecture



Education:

Ph.D., Computing and Information Sciences, Kansas State University, 1989
M.S., Mathematics, Emporia State University, 1984
B.S., Information Systems, Emporia State University, 1981

Teaches software engineering; develops and expands software engineering program, EECS; expands EECS programs at Regents Center for Kansas City (KC) metropolitan audience.

Honors and Awards include IEEE Senior Member, 2001; IEEE Certified Software Development Professional, 2002; Excellence in Teaching Award, University of Nebraska at Omaha, 2000; Distinguished Research Award, University of Nebraska at Omaha, 2000; top 10 software engineering scholars list, *Journal of Systems and Software*, 1998.

K. Sam Shanmugan

S.W. Bell Distinguished Professor, EECS

Research Interests:

- Smart antenna systems
- Signal (image) processing
- Random signals and communications theory
- Wireless and adaptive communication systems and networks
- Communication systems simulation and analysis



Education:

Ph.D., Electrical Engineering, Oklahoma State University, 1970
M.S., Electrical Engineering, Indian Institute of Science, Bangalore, India, 1966
B.S., Electrical Engineering, Madras University, India, 1964

Teaches communication systems, simulation, probabilistic analysis, signals, and systems.

Honors and Awards include EECS Acting Chair, July 1, 2002–July 31, 2003; HOPE Award Finalist, 1994; KU Higuchi Award for Research, 1990; Burlington-Northern Outstanding Teaching Award, 1987; KU Henry E. Gould Award for Distinguished Service to Undergraduate Engineering Education, 1982; Amoco Foundation Outstanding Teacher Award, 1982; Society of Automotive Engineers Ralph R. Teetor Outstanding Young Engineer Award, 1979.

Trevor Sorensen

Associate Professor, Aerospace Engineering

Research Interests:

- Student-designed, -built and -operated satellites
- BalloonSats
- Space environment (Earth and planetary)
- Lunar missions and science
- Remote sensing satellites and missions
- Improvement of spacecraft operations
- Autonomous spacecraft operation
- Long-lived space missions



Education:

D.E., Aerospace Engineering, University of Kansas, 1979
M.S., Aerospace Engineering, University of Kansas, 1976
B.S.A.E., Aerospace Engineering, University of Kansas, 1973

Teaches orbital mechanics, spacecraft systems, space system design, spacecraft attitude dynamics and control.

Honors and Awards include American Astronautical Society Fellow, 2003; NASA/ASEE Summer Faculty Fellowship, 2001, 2003; AlliedSignal Aerospace Bold Thinking Award 1997–1998; University of Kansas Aerospace Engineering Alumni Honor Roll, 1997; NASA Medal for Exceptional Scientific Achievement, 1994; Engineer of the Year nominee, *Design News Magazine*, 1994; AlliedSignal Technical Service Corp.'s Special Recognition Award, 1994; NRL Certificate of Appreciation for contribution to SDIO/LACE Program, 1991; McDonnell-Douglas Certificate of Merit for contribution to Shuttle Program, 1985; NASA Group Achievement Award (STS-41C Rendezvous and Proximity Operations), 1984.

James Stiles

Associate Professor, EECS

Research Interests:

- Radar signal processing
- Applications of information and estimation theory in remote sensing
- Radar remote sensing of vegetation
- Propagation and scattering in random media
- Ground-penetrating radar



Education:

Ph.D., Electrical Engineering, University of Michigan, 1996
M.S., Electrical Engineering, Southern Methodist University, 1987
B.S., Electrical Engineering, University of Missouri, 1983

Teaches electronics, electromagnetics, radar, microwave engineering.

Honors and Awards include Interactive Session Prize Paper Award, IEEE Geoscience and Remote Sensing Society, 2002; KU Miller Professional Development Award for Research, 2001; KU EECS Harry Talley Teaching Award, 2000.

Costas Tsatsoulis

Charles E. Spahr Professor
and Chair, EECS

Research Interests:

- Multiagent systems
- Case-based reasoning
- Machine learning
- Intelligent image analysis



Education:

Ph.D., Electrical Engineering, Purdue University, 1987
M.S., Electrical Engineering, Purdue University, 1984
B.S., Electrical Engineering, Purdue University, 1983
B.A., German, Purdue University, 1987

Teaches computer system software, artificial intelligence, knowledge-based systems, case-based reasoning, multiagent systems, introduction to database systems.

Honors and Awards include KU Spahr Professor, 2000–2004; KU Bellows Fellowship, 1999; Senior Member of IEEE, 1998; Big-12 Faculty Fellowship, 1997; State of Kansas AT&T Engineering Education Excellence Award, 1995; KU Miller Professional Development Award for Research, 1994; Sigma Xi honorary research society, 1992.

Victor L. Wallace

Professor Emeritus, EECS

Research Interests:

- Interactive graphics, virtual reality, and human interface design
- Distributed and real-time systems (scheduling and load balancing)
- Network performance modeling (analytical models of correlated traffic and queues)
- Queuing theory for wide-band and multimedia computer networks
- Operating systems theory



Education:

Ph.D., Electrical Engineering, University of Michigan, 1969
B.S., Electrical Engineering, Polytechnic Institute of Brooklyn, 1955

Taught computer operating systems, interactive graphics, programming languages, and other computer science subjects.

Honors and Awards include Computer Graphics Pioneer Award, ACM SIGGRAPH, 1984; Irving Faye Memorial Award, Polytechnic Institute of Brooklyn, 1955; Senior Life Member, IEEE; Eta Kappa Nu; Upsilon Pi Epsilon; Tau Beta Pi; Sigma Xi; *Who's Who in Science and Technology*; *Who's Who in America*.

New Investigators Starting FY2005

Terry Clark

Assistant Professor, EECS

Research Interests:

- Bioinformatics
- Data management
- Parallel computing



Education:

Ph.D., Computer Science, University of Houston, 1996
M.S., Computer Science, University of Houston, 1988
M.S., Chemistry, University of Houston, 1985
B.S., Chemistry, Western Washington University, 1982

Teaches bioinformatics.

James Miller

Associate Professor, EECS

Research Interests:

- Computer graphics
- Scientific visualization
- Geometric and solid modeling
- Technology in education
- Object-oriented technology



Education:

Ph.D., Computer Science, Purdue University, 1979
M.S., Computer Science, Purdue University, 1976
B.S., Computer Science, Iowa State University, 1975

Teaches programming, computer graphics, geometric modeling, visualization.

Honors and Awards include KU Center for Teaching Excellence (CTE) Excellence in Teaching Award, 2000; Phi

Beta Kappa, 1975; Phi Kappa Phi, 1974; Pi Mu Epsilon, 1974.

Ronald R. Sass

Research Assistant Professor

Research Interests:

- Reconfigurable computing
- High-performance computing
- High-performance networking



Education:

Ph.D., Computer Science and Engineering,
Michigan State University, 1999
M.S., Computer Science, Michigan State
University, 1992
B.S., Computer Science and Engineering,
University of Toledo, 1989 ■

Faculty Achievements *(continued from page 18)*

Jim Stiles, affiliated with ITTC's RSL, acquired the **Harry Talley Excellence in Teaching Award** in May 2004. The award recognizes an EECS professor who has contributed significantly to undergraduate education and has developed a strong rapport with students both inside and outside the classroom. Graduating seniors cast votes to choose the participant. ■

Sponsors and Collaborators

ITTC research projects are funded by a variety of industries and government agencies. On many projects, ITTC investigators work in collaboration with faculty from various schools and departments at KU and/or with researchers from other universities and institutes, both foreign and domestic.

Sponsors

ITTC received funding from the following entities for its research projects active during Fiscal Year 2004.

U.S. Government-Affiliated Agencies:

Defense Advanced Research Projects Agency (DARPA)
Department of the Army Center for Army Lessons Learned (CALL)/University after Next (UAN)
Department of Energy (DoE)
Department of the Navy
National Aeronautics and Space Administration (NASA)
National Institutes of Health (NIH)
National Science Foundation (NSF)

Industry:

Bluetooth Special Interest Group (SIG), Inc.
Butler Heavy Structures
Cigital Corp.
EDaptive Computing, Inc.
Harris Corp.
Honeywell Federal Manufacturing & Technologies (FM&T), LLC

Jerome Mitchell and Demetrus Rorie, undergraduate students from Elizabeth City State University, North Carolina, focus on modeling ITTC's Polar Radar for Ice Sheet Measurements (PRISM) multi-agent system. The two worked at KU during summer 2004 with PRISM's intelligent systems group led by Costas Tsatsoulis. Their models will help improve the data-gathering system.

Nortel Networks
Sprint Corp.

State of Kansas:

Kansas Dept. of Transportation (KDOT)
Kansas Technology Enterprise Corp. (KTEC)

Not-for-Profit Organizations:

Network for Earthquake Engineering Simulation (NEES) Consortium

Collaborators

ITTC projects active during Fiscal Year 2004 included collaborative work with the following KU departments, other universities, and organizations.

KU Schools and Departments:

Aerospace Engineering
Chemistry
Civil/Environmental/Architectural Engineering
Ecology and Evolutionary Biology
Education/Center for Research on Learning
Electrical Engineering and Computer Science
Geography
Higuchi Biosciences Center
KU Medical Center
Mathematics
Molecular Graphics and Modeling Laboratory

Beyond KU:

Alfred-Wegener Institute (Germany)
Antarctic Climate and Ecosystems Cooperative Research Centre (Australia)
Centro de Estudios Científicos (Chile)
Columbia University
Elizabeth City State University
Enterprise Center of Johnson County
Haskell Indian Nations University
Iowa State University
ITKC (for Information Technology—Kansas City)
Jackson State University
Jet Propulsion Laboratory
Kansas State University
KCCatalyst
Lawrence Regional Technology Center
Lawrence Technology Association
Mississippi State University
The Ohio State University
Olathe North High School
Oporto University (Portugal)
Phoang Institute of Technology (Korea)
Shared Spectrum
Stephens Institute of Technology
University of Alaska—Fairbanks
University of Bristol (UK)
University of Cantabria (Spain)
University of Chicago
University of Colorado
University of Copenhagen (Denmark)
University of Missouri—Kansas City
University of Wisconsin—Madison
U.S. Army Cold Regions Research and Engineering Laboratory
Washington University ■



Bioinformatics Research

Life-sciences researchers are seeking answers to some of biology's most fundamental questions. One example involves the remarkably small variations in human genomes that give rise to an extraordinary range of characteristics in people. Solutions to such conundrums may be buried in the flood of biological data researchers are gathering. Unearthing this prized information requires sophisticated investigation and analysis. Bioinformatics does this, combining computer databases and algorithms to store, analyze, and interpret life-sciences data.

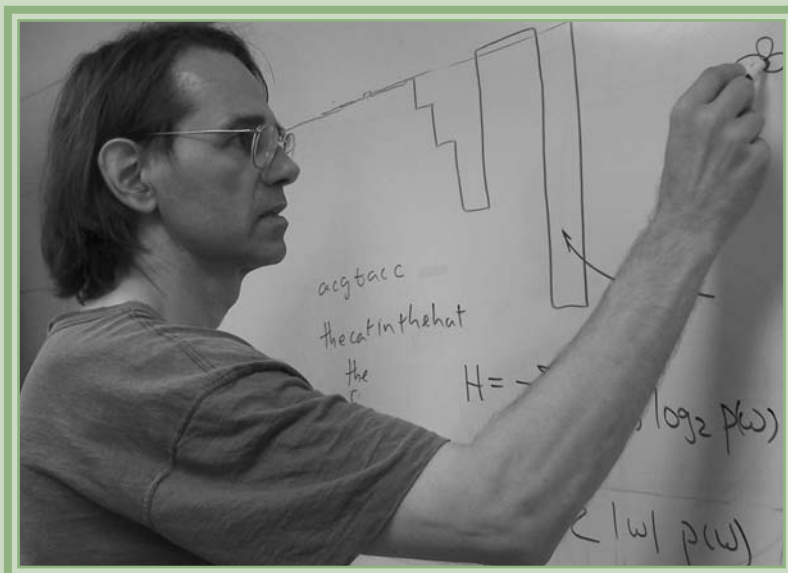
During its recent restructuring, ITTC established the Bioinformatics and Computational Life-Sciences Laboratory (BCLSL). The Center formally included this evolving discipline in its areas of expertise and added another skilled researcher to BCLSL. **Terry Clark** brings a research program in computational methods and data management systems for biomolecular applications. Clark's research includes the study of genomes, protein dynamics, data management, and high-performance computing.

In addition to Clark's work, **Xue-wen Chen** continues with microarray data analysis research. He

is developing computer algorithms based on mathematical/statistical models to analyze biological data, extracting information such as gene identification and gene clustering. Chen's analysis will propel cancer detection and treatment, drug discovery, and research on aging.

Chen became KU's first EECS bioinformatics professor in the fall of 2003. He chose KU because of its interdisciplinary collaboration between departments. ITTC has developed connections throughout the University in fields such as molecular biosciences, medicinal chemistry, pharmaceutical chemistry, and biodiversity.

The Economic Growth Act recently passed by the Kansas Legislature will lead to more collaborative opportunities for researchers within the State. The Growth Act approved \$500 million for life-sciences research and related economic development over the next 10 years. ITTC's growing BCLSL is building national contacts and is positioning itself to become a leader in bioinformatics and computational-sciences research. ■



Terry Clark explains a mathematical analysis of DNA. Professor Clark, who joined ITTC in the summer of 2004, brings a research program in compute- and data-intensive computing methods with one area of focus in biomolecular applications, including the study of genomes and protein dynamics.

Computer Systems Design

Computer systems design is one of the top 10 fastest growing industries in the country. Its expected growth rate by 2012 is more than three times that of the overall economy, according to the U.S. Department of Labor's *Career Guide to Industries* (2004–05 Edition). To accommodate research opportunities in this evolving field, ITTC established the Computer Systems Design Laboratory (CSDL). The following projects highlight some of the research taking place within CSDL.

An NSF Information Technology Research (ITR) grant is funding the “Computation and Communication in Sensor Webs” project led by **Jerry James** and **David Andrews**. Their redesign of sensor webs will allow them to use less power while producing better intelligence than do current architectures. Sensors with communication capabilities pass data among themselves to better detect and track objects. They could help detect and track terrorists, military movements, shipments of suspect materials, and other information critical to the nation's defense, said James, principal investigator (PI) on the project and assistant professor of EECS.

Andrews, an associate professor of EECS, is the principal investigator (PI) on the NSF-funded project “Extending the Thread Execution Model for Hybrid

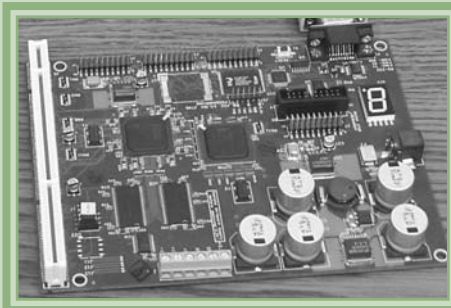
CPU/FPGA Architectures.” Andrews and **Douglas Niehaus**, co-investigator (Co-I) and associate professor of EECS, are developing system software for hybrid chips that will be important components in future real-time and embedded control (RTEC) systems. RTEC systems can be found in high-end automobiles, airplanes, or machines on a factory floor—anyplace where sets of computers work together to perform functions. System software for these chips must provide a general set of capabilities to support the widening range of applications but must also provide specialized support to satisfy a particular application's performance needs.

On another project, researchers will finish writing the standard for the system-level design language Rosetta by January 2005. The standard ensures that different computer-based systems can use Rosetta, said **Perry Alexander**, principal investigator on the project and director of CSDL. Issues such as processing and power must mesh with a system's safety and timing. If one aspect is changed, it will affect other facets of the system. Rosetta allows these different parts of the whole to interact with one another. This interaction allows a greater trust in the correctness of the design and fewer errors in the actual design. ■

CSDL researchers program chips for this field programmable gate arrays (FPGA) board.

These new chips are integral to the creation of commercial, easily obtainable hardware platforms for future real-time embedded control (RTEC) systems.

(Right) Ph.D. student Razali Jidin works in the Computer Systems Design Lab. CSDL research will improve the design of computing systems, from small, embedded elements to large and distributed computing environments.



ChatTrack

ITTC researchers hope to curb deceptive and potentially harmful usage on the Internet with software they developed. ChatTrack provides a permanent record of instant messaging and chat room exchanges that can be reviewed. The software's profile and retrieval mechanisms provide new safety and security tools for parents, the government, and businesses.

Unlike e-mail, instant messaging and chat room conversations are transitory activities. Discussions are not archived, so there is no way to review who said what to whom after the fact.

While ChatTrack is not meant to be a "Big Brother" device, it does aim to protect children and national security, says **Susan Gauch**, ChatTrack developer and director of ITTC's Intelligent Systems Laboratory (ISL). Chat rooms aimed at children must provide a higher level of monitoring than those aimed at adults, to create "safe areas" for children, Gauch says. Within the ChatTrack program, ChatRetrieve flags questionable topics, such as sex, violence, drugs, and/or gangs, for parental review. For example, "Alice" may be in a chat room with 10 different people. During that time, only she and "Charlie" discuss topics that may be inappropriate. While Alice's other nine conversations will not be tagged, the one with Charlie will be.

Gauch and her students developed a ChatTrack version that could be downloaded onto home computers to track instant messaging. A server-based version would allow chat room operators to archive and monitor activities in their chat rooms. They also created a version that would allow a robot to sign in and collect chat room messages, so a third party could monitor chat rooms. Intelligence agencies could use the robot to monitor specific chat rooms. Through ChatProfile, rooms and participants are monitored for topics of interest, such as bomb making. The government can then gather those chats through the ChatRetrieve program.

With the increasing recognition of the legal need to track communication in corporations, retrieval of chat history is now of great interest. Electronic meetings that take place over several days or weeks also need to be tracked. Companies could choose between multiple versions of ChatTrack. They could install the software on each computer to monitor the end users, or room providers could monitor their own rooms.

Gauch gave a demonstration of the technology to the Department of Homeland Security in July. ITTC is reviewing a number of opportunities to transfer this technology to the private sector. ■



While children play computer video games or conduct online research for a school assignment, they can also participate in much more dangerous activities through instant messaging and chat rooms. People misrepresenting themselves, such as adults pretending to be children, could gather personal information or arrange clandestine meetings with the children. Parents have a new safety and security tool with ChatTrack, which provides a permanent record of chat room exchanges that can then be reviewed.

SmartXAutofill

ITTC researchers have developed SmartXAutofill to aid users of XML (eXtensible Markup Language) to enter information online. SmartXAutofill is an intelligent assistant for automating data entry for XML documents by predicting the values of the XML nodes.

XML is the simplified markup language (symbols and rules for displaying documents online) endorsed by the World Wide Web Consortium, which establishes the standard protocols for Internet use. Converting data to XML's simple, flexible format facilitates the exchange of data between computer systems and databases that contain data in incompatible formats.

Each professional or academic discipline defines and uses its own XML tags and grammars. Using XML, people in the same discipline (for example, chemists, biologists, or businesses) can share data without worrying about its format.

However, while current XML tools can simplify the implementation process, large amounts of data must still be manually entered into XML documents. Consequently, autofill technologies have been invented. But existing autofill technologies are mainly for simple data entry, such as online shopping and login forms, and do not support the complexity and nested structures of XML grammars. As XML has become the primary standard of data representation and data exchange within businesses and academic disciplines, SmartXAutofill will become an important time-saving tool.

Danico Lee, ITTC lead software engineer, and **Costas Tsatsoulis**, professor and chairman of KU's EECS Department, created SmartXAutofill with the observation that collections of data—whether in a row of a database or the data in an XML document—are usually related. For example, the value "prostate cancer" will appear only with the value "male," and the value of "Lawrence" will appear only with the values "Indiana," "Kansas," "Massachusetts," "Michigan," "Mississippi," "Nebraska," "New York," or "Pennsylvania."

The technology developed by ITTC researchers not only supports the complexity and nested structures of XML grammars but also incorporates predictive techniques from machine learning to achieve higher accuracy than current auto-complete technologies can offer. In addition, SmartXAutofill integrates multiple internal classification algorithms into a single architecture. It adapts itself to the specific XML domain without the need to develop special programs for each domain. By using the SmartXAutofill technology, the time and effort needed for the data entry process for XML documents can be greatly reduced.

SmartXAutofill is currently available for licensing to existing XML application users and/or vendors. For more information, please contact **Keith Braman**, ITTC's associate director for applied technology, kbraman@itc.ku.edu.

(Left to right) Principal investigator Danico Lee stands with ITTC student researchers Steven Perry and Annaram Krishnaswamy and co-investigator Costas Tsatsoulis with their SmartXAutofill poster. They are now looking for a licensee for the smart data assistant that automates XML data entry by predicting the values of the XML nodes.



Projects Active FY2004

Automated Test Generation in Intelligent Systems (GENISYS), Phase II

EDaptive Computing, Inc.
W.P. Alexander

Center for Excellence

Kansas Technology Enterprise Corporation (KTEC)
T. Johnson

Characterize API for Real-Time Computing Systems and Test upon Processor Upgrades (CART)

EDaptive Computing, Inc.
W.P. Alexander

CISE Research Infrastructure: Ambient Computational Environment

National Science Foundation (NSF)-Computer & Info Science & Engineering (CISE)
G. Minden; with A. Agah, F. Brown, J. Evans, S. Gauch, C. Tsatsoulis

Collaborative Project: Expansion and Enhancement of the Center of Excellence in Information Assurance Program

NSF
H. Saedian

Collaborative Research: An Initiative for a Cyber Protection Center

NSF
H. Saedian

Community Workshop on Computational Simulation and Visualization Environment for NEES

Network for Earthquake Engineering Simulation (NEES) Consortium, Inc.
W.M. (K.) Roddis

Cryospheric Advanced Sensor (CAS): A Spaceborne Microwave Sensor for Sea Ice Thickness and Snow Cover Characteristics—Instrument Incubator Program (IIP)

National Aeronautics and Space Administration (NASA)-Jet Propulsion Laboratory (JPL)
T. Akins; with S.P. Gogineni

Development Multilink PPP Technologies from Iridium

Harris Corp.
V. Frost

Development of a Fused Ice Classification Scheme

U.S. Dept. of Navy
C. Tsatsoulis

Development of a Monostatic/Bistatic Synthetic Aperture Radar System for Two-Dimensional Mapping of Basal Ice Conditions

NASA Goddard Space Flight Center (NASA Earth System Science Fellowship Program)
S.P. Gogineni (Ph.D. student: J. Paden)

Distributed Scheduling Aspects for Time-Critical Targeting [Subcontract]

Defense Advanced Research Projects Agency (DARPA; Washington University, prime contractor)
R.D. Niehaus

eCIS (Enterprise Component Integration System) Tool Development, Phase II

EDaptive Computing, Inc.
W.P. Alexander

Electronic Sensor System Engineering and Capture Environment (ESSENCE)

EDaptive Computing, Inc.
W.P. Alexander

Extending the Thread Execution Model for Hybrid CPU/FPGA Architectures

NSF
D. Andrews; with R.D. Niehaus

Flexible Wireless Systems for Rapid Network Evolution

NSF
J. Evans; with G. Minden

Future of Spectrum: Technologies and Policies Workshop

NSF
G. Minden; with J. Evans

High-Resolution Ice Thickness and Plane Wave Mapping of Near-Surface Layers

NSF
P. Kanagaratnam; with D. Braaten

Ice-Thickness Measurement over the Patagonian Glaciers and the Pine Island and Thwaites Glaciers, Antarctica

NASA-Goddard Space Flight Center
P. Kanagaratnam; with S.P. Gogineni

Identify Informative Genes for Cancer Classification

NSF/KTEC
X.-w. Chen

Information Systems Technologies for the Earth Science Technology Office

NASA-Goddard Space Flight Center
G. Prescott

Intelligent Knowledge Management Environments

U.S. Dept. of the Army Center for Army Lessons Learned (CALL)/University after Next (UAN)
E. Meyen; with R. Aust, J. Gauch, S. Gauch

Interoperability Testing of Bluetooth Devices: Implementation

Bluetooth Special Interest Group (SIG), Inc.
D. Deavours; with J. Juola

Interoperability Testing of Bluetooth Devices: Prototype

Bluetooth (SIG), Inc.
D. Deavours

Investigation of AQUA Response to Stratiform Precipitation Systems [Subcontract]

NASA (University of Wisconsin-Madison, prime contractor)
D. Braaten

ITR Collaborative Research: Enabling the Science Environment for Ecological Knowledge

NSF
J.H. Beach; with A.T. Peterson, S. Gauch, D.A. Vieglais

ITR: Computation and Communication in Sensor Webs

NSF
J. James; with D. Andrews

ITR/SI+AP: A Mobile Sensor Web for Polar Ice Sheet Measurements

(Also known as **Polar Radar for Ice Sheet Measurements [PRISM]**)

NSF/NASA/KTEC

S. P. Gogineni; with C. Allen, V. Frost, D. Braaten, G. Prescott, C. Tsatsoulis, A. Agah

K-16 Over Tuttle Creek Fatigue Repair Project

University of Kansas (KU)/Kansas Dept. of Transportation (KDOT)

W.M. (K.) Roddis; with G. Ramirez

Kansas Participation in Sea Winds Instrument Activities

NASA

R.K. Moore

Kansas Universities' Technology Evaluation Satellite Pathfinder Mission (KUTESat)

NASA-JPL

T. Sorensen

KU Antenna Range Improvements

Honeywell Federal Manufacturing & Technologies (FM&T), LLC

C. Allen

KU High Altitude Balloon Experiment System and the KUBESat-1 Project

Honeywell FM&T, LLC

T. Sorensen

Machine Learning for Failure Prediction in Computer-Controlled Devices

Cigital Corp.

W.P. Alexander

Model-Based Data Inversion to Estimate Accumulation Rate of Polar Ice Sheets

NASA (Earth Science Enterprise Fellowship)

S.P. Gogineni (Ph.D. student: V. Ramasami)

Model-Based Signal Processing Algorithm for MIDP GPR, MIDP GPR Proposal

NASA-JPL

S.P. Gogineni; with M. Dawood

National Radio Networking Research Testbed (NRNRT)

NSF

G. Minden; with J. Evans, J. Roberts

Optical-Domain Performance Monitoring for Next Generation Optical Networks

Sprint/Nortel Networks

R. Hui

Optimal Space-Time Waveform Design for Adaptive, Multi-Mode Radar

Science Applications International Corporation (SAIC)

J. Stiles

Phased-Arrayed Antenna System Development

Honeywell FM&T, LLC

C. Allen

PMD Characterization of Installed Fiber

Sprint

C. Allen

Protocol, Profile, and Interoperability Testing of Bluetooth Devices

Bluetooth SIG, Inc.

J. Evans; with D. Deavours

Quantifying the Temporal Characteristics of Congestion Events in the Internet

NSF-CISE

V. Frost; T. Duncan

Radar Sounder for Measuring Sea Ice Thickness—A Feasibility Study

NASA (with JPL)

S.P. Gogineni; with B. Holt, R. Kwok (of JPL); J. Maslanik (of University of Colorado)

Radar Sounding and Airborne High-Resolution Mapping of Near-Surface Layers of the Greenland Ice Sheet

NASA-Goddard Space Flight Center

S.P. Gogineni; with D. Braaten

Reduced Brace Section (RXS): Proof of Concept

Butler Heavy Structures

W.M. (K.) Roddis; with A. Matamoros

Reporting System to Improve Safety of the Blood Supply [Subcontract]

National Institutes of Health-National Heart, Lung, and Blood Institute (Columbia University Dept. of Health and Human Services, prime contractor)

C. Tsatsoulis

Rosetta Tools and Techniques IR&D–2001

EDaptive Computing

W.P. Alexander

Scalable Performance Models for Large Scale Networks with Correlated Traffic [Subcontract]

NSF (University of Missouri-Kansas City, prime contractor)

V. Wallace

Second Workshop for High School Students of Mathematics and Science

NSF-Engineering (ENG)

B. Pasik-Duncan

Second Workshop for High School Teachers of Mathematics and Science

NSF-Engineering (ENG)

B. Pasik-Duncan

SGER: System-Level Network Modeling

NSF

W.P. Alexander

STI: Flexible Wireless Systems for Rapid Network Evolution (REU Supplement)

NSF

J. Evans; with G. Minden

Stochastic Systems and Control

NSF

T. Duncan; with B. Pasik-Duncan

Support for Wireless Networking Workshop and PI Meeting

NSF

G. Minden

System Level Design of Embedded Systems

NSF

W.P. Alexander

Ultra-High-Capacity Optical Communications and Networking: III-Nitride Wide Bandgap Semiconductors for Optical Communications

NSF

R. Hui; with H. Jiang and J. Liu (of Kansas State University)

Validation of AMSR Snow Depth on Sea Ice Retrievals Using an Airborne Pulse Radar

NASA-Goddard Space Flight Center

S.P. Gogineni; with G. Prescott ■

ITTC-Affiliated Publications FY2004

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J.B. Evans; ORBIT Testbed PI Meeting, New Brunswick, N.J., December 10, 2003 (Invited). Also, WHYNET Testbed Meeting, Los Angeles, Calif., November 7, 2003 (Invited).

Optimization of the ABCD Formula for Melanoma Diagnosis Using C4.5, a Data Mining System.

R. Andrews, S. Bajcar, J.W. Grzymala-Busse, Z.S. Hippe, C. Whiteley; *Proceedings 4th International Conference on Rough Sets and Current Trends in Computing (RSCTC'2004)*, Uppsala, Sweden, June 1–5, 2004.

Outreach Activities of the Polar Radar for Ice Sheet Measurements (PRISM) Project.

D. Braaten, J. Holvoet, C. Bowen, M. Koeppel, S.P. Gogineni; IGARSS'03, Toulouse, France, July 21–25, 2003.

Performance Evaluation of Telephony Routing Over IP (TRIP).

M.C. Schlesener, V.S. Frost; 2003 IEEE Workshop on IP Operations and Management (IPOM), Kansas City, Mo., October 1–3, 2003.

Polar Ice Sheet Propagation Model for Ground-Based Broadband VHF Synthetic Aperture Radar.

J. Paden, C. Allen, S.P. Gogineni, J. Pingenot, J. Marz; *Proceedings Progress in Electromagnetics Research (PIERS'03)*, Waikiki, Hawaii, October 13–16, 2003.

Polar Radar for Ice Sheet Measurements.

S.P. Gogineni, G. Prescott, D. Braaten, C. Allen, K. Jezek, the PRISM Research Team; IGARSS'03, Toulouse, France, July 21–25, 2003.

Rain Heights Over the Oceans: Relation to Rain Rates.

B. Natarajakumar, V. Kurisunkal, R.K. Moore, D. Braaten; URSI Commission F Triennium Open Symposium, Great Barrier Reef, Cairns, Australia, June 1–4, 2004.

Random Walk Around Some Problems in Identification and Stochastic Adaptive Control with Application to Finance.

B. Pasik-Duncan; *Proceedings of AMS-SIAM of the Workshop on Mathematics of Finance*, Utah, 2004.

Random Walk Around the Problems in Identification and Adaptive Control of Stochastic Systems.

B. Pasik-Duncan; *Proceedings 9th IEEE International Conference on Methods and Models in Automation and Robotics*, Miedzydroje, Poland, 2004, pp. 17–25.

Results of an Iridium-Based Data Communications System Providing Internet Access to Polar Expeditions.

A. Mohammad, V.S. Frost, D. Braaten; *EOS Transactions American Geophysical Union Fall Meeting*, Vol. 84(46), San Francisco, Calif., December 8–12, 2003.

Rough Set Approaches to Incomplete Data.

J.W. Grzymala-Busse; 7th International Conference on Artificial Intelligence and Soft Computing (ICAIS'2004), Zakopane, Poland, June 7–11, 2004.

Rules from Belief Networks: A Rough Set Approach.

T. Mroczek, J.W. Grzymala-Busse, Z.S. Hippe; *Proceedings 4th International Conference on Rough Sets and Current Trends in Computing (RSCTC'2004)*, Uppsala, Sweden, June 1–5, 2004.

SCIMPS: An Integrated Approach to Distributed Processing in Sensor Webs.

D. Andrews, J. Evans, V. Mangipudi, A. Mandapaka; *Proceedings 5th International Symposium on Intelligent Components and Instruments for Control Applications*, Aveiro, Portugal, July 9–11, 2003, pp. 25–31 (Invited).

A Taxonomy of Software Architecture Specification Methods.

J. Ryoo, H. Saiedian; *Proceedings International Conference on Software Engineering and Research*, May 2004, pp. 158–162.

An Ultra-Wideband Radar for Measurements of Snow Thickness Over Sea Ice.

S.P. Gogineni, K. Wong, K. Sudarsan, P. Kanagaratnam, T. Markus, V. Lytle; *IGARSS'03*, Toulouse, France, July 21–25, 2003.

Using Multi-Threaded Computation Model as Unifying Framework for Hardware-Software Co-Design and Implementation.

D. Niehaus, D. Andrews; *Proceedings 9th International Workshop on Object-Oriented Real-Time Dependable Systems (WORDS 2003)*, Capri, Italy, September 2003, pp. 317–324.

Utility-Based Multiagent Coalition Formation with Incomplete Information and Time Constraints.

L.-K. Soh, C. Tsatsoulis; *IEEE International Conference on Systems, Man, and Cybernetics*, Washington, D.C., October 5–8, 2003.

Web-Based Tools for Educators: Outreach Activities of the Polar Radar for Ice Sheet Measurements (PRISM) Project.

D. Braaten, J.F. Holvoet, S.P. Gogineni; *EOS Transactions American Geophysical Union Fall Meeting*, Vol. 84(46), San Francisco, Calif., December 8–12, 2003.

Wideband RF Modulation.

G.J. Minden; Office of the Secretary of Defense/Assistant Secretary for Network and Information Integration, Washington, D.C., September 2003 (Invited). Also, Office of the Secretary of Defense/Undersecretary for Acquisition, Technology, and Logistics, Washington, D.C., October 2003 (Invited).

Patents

Method and Apparatus to Compensate Polarization Mode Dispersion.

C. Allen; U.S. patent no. 6647176, November 11, 2003.

Optical Spectral Analyzer (OSA).

R. Hui; U.S. patent no. 6697159, February 24, 2004.

True 3-D (T3D) System.

S. Chakrabarti, U.S. patent no. 6646623 B1, November 11, 2003 (a “continuation in part,” along with no. 5717416, February 10, 1998 and no. 6005608, December 21, 1999—all based on the original invention). ■

Acronyms

Used Undefined Elsewhere in this Annual Report

AAI	ACTS ATM Internetwork
ACT(S)	(NASA’s) Advanced Communications Technologies (Satellite)
ATM	Asynchronous Transfer Mode
AUTM	Association of University Technology Managers
CSIS	Center for Strategic and International Studies
DoE	U.S. Department of Energy
EECS	Electrical Engineering and Computer Science
ITKC	Information technology networking organization based in Kansas City
ITR	Information Technology Research
NASA	National Aeronautics and Space Administration
NSF	National Science Foundation
RF	Radio frequency

ITTC Support Staff



Left to right,
back row:
Peggy Williams,
Nancy Hanson;
middle row:
Kelly Mason,
Robin Hinman,
Paula Conlin;
front row:
Michelle Ward,
Michelle Ferguson,
Annie Francis

ITTTC support staff members assist with the daily functioning of the Center by handling administrative details. Below, in reverse alphabetical order, are the staff during FY2004 and their responsibilities.

Peggy Williams, Program Assistant. Acts as assistant to the director of ITTC; coordinates and manages recruitment activities; manages and tracks ITTC accounts; prepares and files immigration and visa documents for staff; organizes workshops, conferences, symposia, and other presentations.

Michelle Ward, Public Relations and Marketing Coordinator. Manages publicity with local news media and state and industry contacts; composes and publishes ITTC's newsletters; writes press releases and the text for *Annual Report*; creates other publicity materials for the Center.

Kelly Mason, Program Assistant. Manages and coordinates budgets, purchasing, and student appointments for PRISM and other grants; assists with proposals and reports; provides support for RSL faculty and staff.

Robin Hinman, Research Administration Specialist. Manages payroll, accounts payable, and purchasing; tracks finances on all Center projects and performs budget projections.

Nancy Hanson, Program Assistant. Acts as assistant to ITTC executive director; assists with KTEC-related functions; tracks, and maintains records for, Center proposals

and awards; calculates annual income and expenditures; manages publication of *Annual Report*; designs and executes layout for *Annual Report* and other publications; coordinates Industry Advisory Board meetings.

Annie Francis, Office Specialist. Manages new-student check-ins and appointments; maintains student information database; maintains Nichols space-assignment database; provides word processing for faculty and staff; coordinates workshops, conferences, and event hospitality; arranges travel for faculty and staff.

Michelle Ferguson, Student Office Assistant. Maintains ITTC office supplies stock; assists facilities coordinator with courier/mail/express shipment services, key maintenance, conference room scheduling; performs word processing, copying, filing, database processing to assist faculty and other staff; runs errands on and off campus; assists with *Annual Report* preparation.

Paula Conlin, Nichols Hall Facilities Coordinator. In charge of building maintenance requests, key maintenance, telephone administration, conference room scheduling, courier/mail services/express shipments, and other facility matters. ■

Fiscal Year 2004 Overview *(continued from page 4)*

- Provided national leadership, through ITTC faculty, on future spectral management issues. Activities included organizing two NSF/FCC workshops (with a third planned), chairing a Defense Science Board task force on wideband RF modulation, and participating in a CSIS Commission on Spectrum Management.

Other ITTC Highlights

Following are additional ITTC FY2004 accomplishments not mentioned elsewhere in this *Annual Report*. Please see also the “Faculty Achievements” listed on page 18.

- **U.S. Army \$2.3M Proposal:** ITTC took the leading role in coordinating a \$2.3M proposal to the U.S. Army's Edgewood Chemical Biological Center for the “Development of an Integrated Bioinformatics Information Infrastructure.” This interdisciplinary proposal will develop a systematic integrated bioinformatics information infrastructure, which is critical for fostering multi-faceted (and often inter-related) bio-science efforts.
- **New Cerner Software Engineering Laboratory at ITTC:** The Cerner Corporation, a leading supplier of health care information technology solutions, has provided funding for a new laboratory within ITTC. The Cerner Software Engineering Laboratory features hands-on tools, software applications, and computers.
- **ITTC Working with KTEC's Incubators:** An ITTC spin-out company, Cadstone, has become a client of the Lawrence Regional Technology Center (LRTC). LRTC is providing the needed business services and expertise to help Cadstone succeed. Likewise, the Enterprise Center of Johnson County (ECJC) and ITTC are working with a new start-up company founded by a new M.S. graduate from the Electrical Engineering and Computer Sciences (EECS) Department at the University of Kansas.
- **New NSF Information Technology Research (ITR) Grant, “Computation and Communication in Sensor Webs”:** Sensor webs—collections of sensors with communication capabilities—pass data between individual sensors to better detect and track objects of interest.
- **National Earthquake Forum:** ITTC hosted a national earthquake engineering forum, including 40 earthquake engineering research experts.
- **Phased-Array Antenna System Development:** ITTC performed research for Honeywell Federal Manufacturing and Technologies (FM&T), related to the development of a phased-array antenna system.
- **Machine Learning for Failure Prediction in Computer-Controlled Devices:** ITTC researchers will develop technology for Cigital Inc., a software quality management company. Researchers will develop software that attempts to predict device failure by finding anomalies in data streams from the devices.
- **NASA Fellowship:** Graduate student **Vijaya Chandran Ramasami** earned a NASA Fellowship for his graduate education and research. He is the 16th student affiliated with ITTC's Radar Systems and Remote Sensing Laboratory to receive this fellowship.
- **NSF Program Director from KU/ITTC: Joseph Evans,** professor of EECS, left in August of 2003 to begin a two-year term as a National Science Foundation program director. He is leading the Information Technology Research and Career Cross Directorate Programs and helping to set the nation's IT research agenda within NSF's Division of Advanced Networking Infrastructure and Research.
- **IEEE Winner: Nazia Ahmed,** a senior in EECS, won the local round of the student paper contest sponsored by IEEE (Institute of Electrical and Electronics Engineers). Ahmed's paper, “Analysis of the Depth Sounder Radar Data Taken in Greenland,” details her work in analyzing data gathered during field experiments in Greenland.

ITTC plays a significant role in the region, as research centers have been identified as the most important factor in incubating high-tech industries. According to U.S. Department of Commerce indicators, the Association of American Universities estimates that each \$1 million invested in research and development in Kansas produces about 41 jobs in the State.

ITTC's success to date is largely due to the efforts and seeds sown and cultivated over many years. ITTC is performing at a very high level, based on available statistics as compared to state and national averages for R&D organizations. ■

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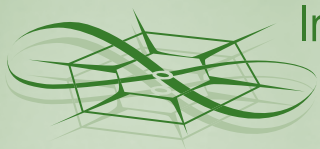
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