



Published by the Integrated Media Systems Center, a National Science Foundation Engineering Research Center at the University of Southern California

## Director's Message

# IMSC launches major new initiatives

It is my pleasure to welcome you to this inaugural edition of the *IMSC News*.

Our ongoing effort to communicate our successes in cutting-edge integrated media systems development takes a giant leap with the start of this newsletter. We plan to showcase our initiatives involving corporate partner relations, education, community outreach and, of course, the research efforts underway in the Media Immersion Environment (MIE), our unifying grand challenge system integration experiment.

As IMSC has evolved over the past two and one-half years, we have always attempted to respond forthrightly to suggestions and recommendations from our advisors. Most recently, we have strengthened our interdisciplinary collaboration beyond the traditional electrical engineering/computer science (EE/CS) collaboration, and we have given new emphasis to human factors issues.

With our recent addition of new faculty outside the fields of EE/CS, we have improved the ratio of key EE/CS

investigators to key non-EE/CS investigators to approximately 55-45 percent from the 80-20 percent ratio in spring of 1998.

I'm pleased to report the following new initiatives. In collaboration with the USC School of Gerontology, IMSC is establishing the Laboratory for the Virtual Assessment of Cognition. The laboratory will be dedicated to addressing human factors issues of IMSC's MIE and, in particular, to developing psychometrically sound and visual tests

of human abilities in areas of attention, memory, and spacial and executive functioning. In addition to contributing to the MIE, the new laboratory will address human factors initiatives for the National Tele-Immersion Initiative.

Two faculty in the School of Gerontology with expertise in clinical psychology, Dr. Albert "Skip" Rizzo and Dr. J. Galen Buckwalter, will become key IMSC investigators. Dr. Rizzo holds a Ph.D. in clinical and experimen-  
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**Chrysostomos L. (Max) Nikias**

## IBM contributes for third straight year

With the contribution of a "Portable IBM Classroom" of laptop computers for IMSC's BioSIGHT project, International Business Machines (IBM) Corp. continued its generous support of IMSC for the third year in a row.

The laptops will be quickly pressed into use for the first time next month when biology students at Newbury Park

High School test the first module of the project. The BioSIGHT project is mapping an entire high school biology curriculum into interactive modules. The portable classroom consists of 20 ThinkPad laptops for students, a ThinkPad laptop with a larger screen for demonstration purposes, and a server.  
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Photo by Tom Randolph

**IBM EXECUTIVE VIEWS IBM EQUIPMENT CONTRIBUTION**—IBM's Al Schleicher (left) and Prof. Sherali Zeadally discuss an ATM switch contributed by IBM to IMSC. Schleicher visited IMSC in November for the Board of Councillors meeting.

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## SAB Chairman cites IMSC's excellent momentum

IMSC has built up excellent momentum in a remarkably short period of time, according to Andrew G. Tescher, chairman of IMSC's Scientific Advisory Board (SAB).

"Since IMSC was launched two and one-half years ago, it has brought together over 50 professors in various disciplines to become a major center for integrated media systems development," he said.

Tescher has served as IMSC's SAB chairman for the past year. He is a Technical Consultant with the Interactive Technology Center (ITC) of Lockheed Martin Mission Systems in Sunnyvale, Calif.

In his career, Tescher has provided leadership in fields involving a wide range of signal processing, radar systems, device technologies, communication studies and related system integration projects.

As Technical Consultant with Lockheed Martin's Interactive Technology Center, Tescher advises on compression/multimedia applications and related system issues. He is the principal Lockheed Martin representative to several international standards organizations developing advanced multimedia technologies, including those working on the JPEG image compression standard and the MPEG multimedia standard. These JPEG and MPEG technical organizations are the premier industrial groups developing the entire range of compression/multimedia technologies for broadcast, mobile, Internet and related major application fields.

Tescher is the co-inventor of several teleconferencing systems and co-author of related key patents, which, in part, defined the JPEG and MPEG transmission standards. He invented the first low bandwidth video phone.

Tescher sees IMSC's Scientific Advisory Board as a key advisory body in helping IMSC to be responsive to multimedia needs of industry. Representatives from IMSC's member companies sit on this Board. IMSC provides additional seats on the Board



Photo by Tom Randolph

**AT NOVEMBER SAB MEETING**—SAB Chairman Andrew Tescher (left) chats with SAB member James D. Baker, president and CEO of Fuji Xerox Palo Alto Laboratory, at the SAB's November meeting.

to the State Office of Strategic Technology, the Los Angeles Regional Technology Alliance, and some visionary representatives of small companies. The SAB meets twice a year to review IMSC's research, education, industry and neighborhood outreach programs and provide feedback and suggestions for the direction of the programs to the Center.

"In responding to advice from SAB members, the Center responds quickly and efficiently to industry needs," he said. One suggestion that came out of the SAB meeting in November was that individual SAB members might want to co-sponsor day-long SAB-member gatherings for the purpose of presenting their company's work in relevant research areas and listening to the progress of the other SAB members. Tescher said he is very interested in hearing from other SAB members who might like to co-sponsor such a gathering. His email address is [andy.tescher@lmco.com](mailto:andy.tescher@lmco.com).

Tescher's familiarity with USC goes back to his years in the electrical engineering program as a student. He earned his Doctorate in electrical engineering here. He received his Bachelor's Degree from the City University of New York and a Master's

Degree from Polytechnic University of New York.

Tescher pointed to a remarkable change at USC since IMSC opened its doors in 1996 as a National Science Foundation Engineering Research Center. "For the first time, there was a central coordinating force, a place where multimedia development could progress," he said. "And since then, IMSC has reached beyond the campus to build a national reputation for multimedia in academia and industry."

"The work at IMSC is very advanced," he pointed out. "Major progress is being made in compression, immersive audio, face modeling and wireless communication, to name just a few areas."

### SAB views progress

IMSC's Scientific Advisory Board (SAB) met on November 19 to view the Center's latest initiatives and give feedback.

IMSC investigators described the latest Center initiatives, and SAB members toured IMSC laboratories. The SAB is composed of representatives of IMSC's corporate partners who meet semi-annually.

## IMSC industry partners develop joint project

If it hadn't been for IMSC, NCR and General Dynamics Information Systems (GDIS) might never have joined forces as they have on MovieLoc, a research project to develop a multimedia system to assist in choosing locations for filming movies.

In 1997, each company worked with IMSC on separate projects, but for the 1998-99 academic year, they have come together.

"At first, they worked separately, and now they're collaborating," said Dr. Cyrus Shahabi, an IMSC faculty investigator in information management. "That's the kind of industry collaboration that IMSC is especially positioned to promote."

Dr. Shahabi and Dr. Craig Knoblock, also a faculty investigator in information management, are IMSC's principal investigators on MovieLoc.

As IMSC industry partners, last year both NCR and GDIS (formerly CDI) worked with IMSC faculty and students on research projects that were better suited to a joint project this year. The CDI effort last year focused on integrating data from the World Wide Web, while NCR research involved the enhancement of the Teradata Object Relational Database, a multimedia database.

MovieLoc focuses on the integration of video, images and semi-structured data (Web data) into a geographic information system. It is envisioned that managers in the film industry who scout locations for film shoots could use MovieLoc to find the most suitable locations. They would enter various criteria, and candidate locations would appear on a map. When they click on a location, they would find contact information, pictures, videos and movies already shot at that location. A lighting specialist could find weather and sunlight information.

Also, a director could carry a portable version of MovieLoc on location to augment the real-world



Photo by Tom Randolph

**TWO CORPORATE PARTNERS JOIN FORCES**—Dave Schrader of NCR (center) and Tom Rochat of General Dynamics Information Systems (right) with IMSC's Cyrus Shahabi show poster on their MovieLoc project during recent visit to IMSC.

location with virtual data retrieved from databases. For example, MovieLoc could augment a dry slope with virtual snow so the director could see a snow-covered area in mid-summer.

Dave Schrader from NCR praised the MovieLoc effort and spoke about the larger role of IMSC in assisting NCR in developing contacts in the film industry.

"Our goal at NCR is to leverage IMSC linkages to sell data warehouses to Hollywood, and IMSC has been instrumental in helping us get introductions and invitations," he said.

Based in El Segundo, Calif., Schrader is the Marketing Manager of the Teradata database. He became Marketing Manager some months ago after working in technical development on the project as Director of Engineering/Multimedia.

Schrader is a member of IMSC's Scientific Advisory Board (SAB) and Board of Councillors (BOC), and he has become involved in many other IMSC activities over the years. He spoke to Shahabi's class, gave a presentation at an IMSC colloquium and judged student projects in a competition at the IMSC student retreat. In recognition of IMSC's successful work on the Teradata data-

base, Schrader came to campus to celebrate by presenting certificates of appreciation to students and faculty members. IMSC's work was incorporated into the beta version 1.0 of the software and is under consideration for release in version 2.0.

"We have the tightest imaginable relationship with the university through our involvement with IMSC," Schrader pointed out.

He recommended that the best way for industry partners to take advantage of their IMSC relationship is to "structure the relationship as a contract for hard deliverables and then when they are completed, congratulate students and faculty members for the good work." He cited the celebration he organized for the students and faculty, at which they were surprised with a celebration cake and were given T-shirts and certificates of accomplishment.

Tom Rochat, a software system engineer and GDIS's representative on the MovieLoc project, also praised the role of IMSC in bringing the two companies together. Both Rochat and Schrader said the collaboration came about as a result of the relationship they

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# Philips hires two IMSC graduates for N.Y. lab

As an IMSC industry partner, Philips has taken advantage of its ready access to students as prospective employees and has hired two IMSC graduates to full-time positions.

The graduates are now working at Philips Research Laboratories in Briarcliff, NY, one having worked as a student intern first and the other having been recommended by her faculty advisor to the full-time position.



**Mi-Suen Lee**

“It’s a great example of how IMSC has developed synergistic relationships with industry partners that assist students as well,” according to Chrysostomos L. (Max) Nikias, IMSC’s director.

Mark Hoffberg, a consulting scientist with Philips and a member of IMSC’s Scientific Advisory Board, agreed with Nikias, stressing that the opportunity to attract student interns stands out as a major reason for the company’s involvement with the Center.

The IMSC graduates, Panagiotis Reveliotis and Mi-Suen Lee, work only a few doors away from each other at Philips’ Briarcliff operation, the Dutch company’s major research center in the United States.

Reveliotis joined Philips full time last May after he received a Master’s Degree in electrical engineering, and Lee started last October after she received a Doctorate in computer science.

Reveliotis began his involvement with Philips in 1997 when he was chosen for a summer internship. He was recommended by his IMSC faculty advisor for the internship, and he spent the three months as a full-time, paid intern at the company’s multimedia center in Palo Alto. As a member of Philips’ Exploratory Development Group, he worked on World Wide Web applications, using Java and Virtual Reality Modeling Language (VRML)



**IMSC GRADUATE AT NEW JOB**—IMSC graduate Panagiotis Reveliotis outside of Philips Research Laboratories in Briarcliff, NY.

programming. “I didn’t even know VRML in the beginning, and I was giving demos at the end,” he said. Reveliotis’ supervisor, Eugene Shteyn, a senior software engineer, praised his work with VRML and Java in creating three-dimensional Web models on an experimental basis.

Reveliotis maintained contact with Philips after the internship, and his efforts paid off when he was hired to work at the Briarcliff labs. So, after finishing his Master’s, he headed out to the East Coast to work as an associate member of Philips’ Digital TV Interactive Services in the user interface area.

Reveliotis pointed out that he is working on digital television at an exciting time—last November 1, television stations in the United States first began transmitting a digital signal for high definition television.

“It’s cutting edge technology. I will be able to watch the technology change and evolve,” he said. His work involves programming in Java.

Reveliotis, who specialized in image and audio signal processing at IMSC, said that at first high definition television will feature superior pictures and sound, but later it will support

various applications through its digital technology. For example, in the second stage, a viewer might be able to request information from a database on a sports figure while the game is going on.

Reveliotis praised IMSC, saying that it was just the kind of academic environment that he wanted when he arrived in the United States from Greece. He’d earned his Bachelor’s Degree from the National Technical University in Athens and then spent 18 months in the army.

“At IMSC, I enjoyed working in the audio lab and working with BioSIGHT (a project developing an interactive high school biology curriculum),” he said. He also contributed to a research paper with IMSC professors.

Mi-Suen Lee also spoke highly of IMSC and noted that she heard about the Philips position from her faculty advisor. After earning a Master’s Degree in computer science in Hong Kong, she came to the United States to study at USC. She spent six years on campus, culminating in the award of her Doctorate in August. She became involved with IMSC when it was created in 1996, and she said IMSC

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# BOC members meet for first annual session

IMSC's Board of Councillors (BOC) met for its first annual meeting on November 20, with BOC Chairman Dr. Karl Weiss, vice chairman of the Massachusetts Technology Park, convening the day-long gathering.



**Dr. Karl Weiss**

The BOC, which was formed to provide visionary and strategic counsel to the Center, is comprised of executives of selected organizations involved in the multimedia field.

Through their participation in BOC meetings, these high-level executives will "provide long-term strategic guidance to IMSC," according to Chrysostomos L. (Max) Nikias, IMSC director.

"We are seeking an expanded window to the ever-changing field of multimedia," he said.

He added that the BOC will provide assistance to IMSC in identifying "new developments in current multimedia application areas and technologies."

BOC members come from many diverse organizations in such areas as



Photo by Tom Randolph

**FIRST ANNUAL BOC MEETING**—BOC members discussed strategic directions for IMSC at their first meeting on November 20.

computer software and hardware development, manufacturing, research and development, aerospace, film making, journalism and academia.

In considering current multimedia issues, BOC members attended breakout sessions on "Multimedia Education: Now and in the Future," "Major Technical Barriers for Multi-

media," and "Commercialization of Multimedia Technologies." Each member chose one of the three sessions to attend. After the discussions, each breakout group made recommendations for consideration by IMSC. BOC members also visited IMSC labs and met with IMSC investigators and students.

## IMSC investigator named to State education panel

Dr. Wee Ling Wong, principal investigator for IMSC's BioSIGHT project, will have an official voice in recommending the use of better technology in education at California's public schools as a newly appointed member of the State Board of Education's Educational Technology Advisory Committee (ETAC).

"I'm honored to be appointed to the committee, and I anticipate that we'll give valuable input to the Board," she said.

She and six others were appointed in October to the new committee, which met for the first time that month.

Susan Hackwood, executive director of the California Council on Science and Technology (CCST), said that ETAC will be extremely influential in all aspects of the use of technology in kindergarten through twelfth grade. A leading partnership of academia, industry and government that supported the creation of ETAC, CCST identifies ways the fields of



**Dr. Wee Ling Wong**

science and technology can contribute to the improvement of the State's economy.

Wong pointed out that California public schools are far behind public schools in many other states in terms of technology education and said she hopes that the committee will have a chance to improve the situation. "The curricula and equipment are not there, and teachers are not adequately trained in adopting and implementing the new technology," she said.

Wong explained that, as an advisory committee to the State Board,

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## NCR & GDIS . . .

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developed through their work with IMSC.

Rochat, who is a member of IMSC's SAB, also said he was impressed that IMSC offered "a lot of flexibility in defining the project." He noted that GDIS is an early adapter of the Teradata database, so IMSC's work "in adding value" was extremely important to GDIS. Rochat, who is based in Minneapolis, also said that GDIS is interested in IMSC's agent-based technology research.

He also echoed Schrader's assessment that IMSC's corporate partner program provides excellent opportunities to companies of all sizes for collaboration in the multimedia field.

## Wong . . .

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ETAC can influence long-range planning and policy issues for technology in schools, make recommendations for legislation and provide input on curriculum content. In particular, the committee will provide advice to the Board on how the current instructional materials adoption process can be improved or supplemented to enable the timely adoption of electronic learning resources.

Wong has been at USC for nine years, earning a Ph.D. in molecular biology, conducting post-doctorate work and then working for IMSC as an information technology scientist.

### IMSC News

January 1999

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Photo by Tom Randolph

**IMSC STUDENT RECEPTION FOR SAB**—Stephanie Loete (right), IMSC Student Assembly President, greets attendees to a reception sponsored by the students for the Scientific Advisory Board meeting in November.

## IMSC students build strong camaraderie

In developing supplemental activities over the years, IMSC students have succeeded in building strong camaraderie.

Recent activities have included an orientation barbecue, the co-sponsorship of an "Engineering Karaoke Night," and a Movie Night, featuring "A Bug's Life," the animated feature by Pixar that uses state-of-the-art computer techniques. Students also organized a seminar on the technology used in "A Bug's Life" that was offered by Wayne Wooten, who worked on the film as a lighting technical director.

The students have scheduled their annual day-long conference for April 9 at the Davidson Conference Center on campus, according to Stephanie Loete, IMSC Student Assembly President.

Firms in the multimedia field will participate, and students will demonstrate their research projects. One notable highlight will be a speaker panel.

Loete, a senior majoring in electrical engineering with a computer emphasis and a multimedia and creative technologies minor, said that student participation is extensive, especially because of the creation last year of a Student Assembly that includes all IMSC students.

## Philips hires graduates . . .

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brought multimedia into sharp focus at USC.

"Before IMSC existed," she said, "we'd have speakers come to campus to speak on multimedia, but usually they'd only speak on a particular application, instead of talking about the bigger picture. We would rush to hear them, and be disappointed. Anybody could use the term multimedia in a speech. But IMSC changed all that, and now there's a much clearer focus. IMSC has brought lots of expertise in a lot of areas."

Lee also stressed the importance of the kind of collaboration that IMSC promotes. For example, she pointed out that vision and sound are two very different aspects of multimedia and that IMSC provides a valuable channel for collaboration in both areas.

Her research specialty in computer science was vision, and she is using that expertise in her work at Philips in video conferencing. As a senior member of the research staff in the Adaptive Systems Department, Lee is conducting research on a video conferencing product for businesses.

In a further example of the close working relationship that IMSC promotes with its industry partners, Lee is now assisting in building stronger ties by being the contact between Philips in Briarcliff and IMSC.

# Director's Message . . .

(Continued from page 1)

tal psychology, and Dr. Buckwalter has a Ph.D. in clinical psychology with post-graduate work in the neuropsychology of aging.

Another initiative, BioSIGHT, is developing a novel methodology that will map a high school biology curriculum into a series of interactive visualization modules and is also taking steps to strengthen interdisciplinary collaboration and emphasize human factors issues by partnering with two premier organizations—TERC, a nonprofit research organization in Cambridge, MA, and the Center for Technologies in Learning (CTL) of SRI International in Menlo Park, CA.

TERC will provide pedagogical strategies expertise with a team led by Dr. Alan Feldman, TERC's senior project director and cluster leader who has led the development of other technology-enriched educational products. Other TERC project members are Scot Osterweil, a multimedia designer who will contribute to the software design, and Karen Clay, who will develop scenarios for collaborative investigations in BioSIGHT.

CTL will provide assessment and evaluation with a team led by Dr. Robert Kozma. Dr. Kozma is a principal scientist at CTL, and his research specialization is the impact of advanced technology systems on student learning. Other CTL staff members on the project are Tom Hinojosa, who specializes in assessment and evaluation, and Dr. Chris Hoadley, who specializes in the use of technology to support students' scientific discourse. The BioSIGHT module in immunology will be tested next month with students at Newbury Park High School, one of BioSIGHT's collaborating schools.

## Audio information-on-demand system to be developed

We have also defined a new demonstration technology project called the Personal AudioCast (PAC) in collaboration with the Annenberg School for Communication, the Columbia University Graduate School of Journalism, the *Los Angeles Times* and KUSC, a USC campus radio station. The PAC project will develop a user-customized audio information-on-demand system. The system will select customized information from a dynamic database and deliver it in three-dimensional audio form. Sports, finance, entertainment and late-breaking news coverage, as well as public service information, will be provided.

Four of the key investigators are from IMSC: Dr. Dennis McLeod (Principal Investigator), Dr. Carolyn Cline, Dr. Chris Kyriakakis and Dr. Cyrus Shahabi. Other investigators are Patrick Dent, Technical Director of the Online Journalism Program, USC Annenberg School for Communication, and Lecturer in the School of Journalism; Prof. John V. Pavlik, Director of the Center for New Media, Columbia University Graduate School of Journalism; Prof. Larry Pryor, Director of the Annenberg School Online Journalism Program and Visiting Professor in the School of Journalism; and Dr. Patricia Riley, Director of the School of Communication in Annenberg.

MovieLoc is another new demonstration technology project to develop an Internet-based geo-spatial multimedia da-



Photo by Tom Randolph

**BOC RECEPTION**—IMSC Director Chrysostomos L. (Max) Nikias (right) talks with IMSC investigator Tomlinson Holman (left) and Dr. Roy Pea of SRI International at the reception at the Board of Councillors meeting in November.

tabase system in support of location management in filming movies. We are in the process of recruiting non-engineering investigators for the project, and we will be recruiting people with film experience from the Hollywood industry. The project is funded in part by NCR, General Dynamics Information Services and the NASA Genesis project.

## Collaboration started with CMU's interactive lab

In another example of partnering with a premier organization, we have established a collaboration with Prof. Alex Waibel's Interactive System Laboratory (ISL) at Carnegie Mellon University in the area of speech technology. IMSC's immersive audio technology will be integrated into Prof. Waibel's laboratory work for further testing and evaluation. In return, we will integrate into IMSC's Media Immersion Environment, ISL's systems for language translation, speech and handwriting recognition and face tracking.

In another interdisciplinary effort, IMSC is working with USC's Fisher Gallery on three interdisciplinary initiatives. In one, IMSC's Multimedia University Academy (MUA) students are assisting the Fisher Gallery and USC's School of Architecture in a project to develop an exhibition entitled, "The Architecture of Social Culture: Museum Architectural Projects in the West." MUA students are participating in the development of a Web site as part of the exhibition.

In a second initiative, IMSC investigators have developed techniques for the digitization of representative objects from the Gallery's Narramore Collection of teapots. Still other IMSC investigators are working on new algorithms for searching image databases on features of interest to museum professionals and art historians such as brush stroke, medium and pictorial content.

We are excited about these new initiatives and hope you enjoy reading about them and the activities of the Integrated Media Systems Center in this first issue of *IMSC News*.

## IBM's contributions . . .

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Bill Lenth, manager of science and technology at IBM's Almaden Research Center in San Jose, praised the BioSIGHT project as helping to address the "huge deficit" in the use of multimedia in the classroom.

Lenth, a member of IMSC's Scientific Advisory Board, reviewed BioSIGHT progress with Dr. Wee Ling Wong, the principal investigator on the project. He had encouraged IMSC to apply for the portable classroom through IBM's competitive research grant program after he visited IMSC in mid-1998.

"I'm excited about BioSIGHT especially because it integrates multiple formats—text, spoken word, and still and video images—to address different learning styles," he said.

Lenth and another IBM executive, Al Schleicher, vice president of Global Finance and Business Operations for IBM's Sales and Distribution Group, have been involved with IMSC from its inception. Schleicher is a member of IMSC's Board of Councilors.

In a visit to IMSC in November, Schleicher spoke of IBM's purpose in developing ties with the Center. "IBM's goal is to build partnerships in academia, government and industry, and IMSC represents the perfect melding of these forces," he said.

Viewing demonstrations at the Center's laboratories, Schleicher said he was "amazed" at how far IMSC had progressed since he first visited in 1996 when the Center was just starting work.

During IMSC's first year, IBM donated a tape backup system with a robotic drive, which, along with other backup systems, is intended for use in backing up many of the servers and individual computers on the IMSC network.

During the second year, IBM gave three asynchronous transfer mode (ATM) switches and associated equipment to provide a boost to IMSC's work in building a fiber optic network for the Media Immersion Environment (MIE).

Prof. Sherali Zeadally, who is deploying the high-speed network, said the ATM switches have been indispensable in IMSC's strategy to link its labs that are located in several buildings on campus. "The ATM switches have helped us tremendously in our efforts to develop and implement our testbed for the MIE. All investigators will have access to a high-speed network especially suited for multimedia," he said.

In contrast to an Ethernet network, Zeadally said, the ATM network provides a quality guarantee, reliability, speed and scalability, making such a network extremely appealing for the kind of high bandwidth transmission required for multimedia research and development.

When IBM's Schleicher visited IMSC recently, he viewed the ATM switches and spoke with Zeadally about their use. Schleicher not only praised IMSC's progress in developing its network, but also applauded the Center's policy of introducing students to corporate partners. "Students graduate from here with first-rate skills, and IMSC offers a great opportunity for recruiting them," he said.

"I'm just so pleased at how IMSC has developed over the years," Schleicher said.

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