Message from the President

2004 saw many firsts and new beginnings at Stevens. The year marked the first graduating class including students who have completed our new Business and Technology major. These graduates have since secured employment in the financial, manufacturing, pharmaceutical, technology, consulting and other industries. Over 90 percent of them gained professional experience prior to graduation as interns, co-op workers or researchers. Bringing hands-on work experience into the classroom is central to the spirit of Technogenesi$, yielding advantages for both our students and the Institute.

Speaking of the Class of ’04, this year’s commencement ceremony was the first held outdoors in many years. This was well received, it may mark the beginning of a new Stevens tradition.

During 2003-04, we initiated a number of new international agreements to share resources and develop Technology worldwide, adding to our traditional – and expanding – outreach efforts (map, page 4). Although some media commentators evaluate the world’s appetite for technology by the crude measure of the stock performance of ‘tech companies’, our view is that the desire for technology, and technically-trained people, continues to escalate. The demand for new solutions and a new kind of worker capable of implementing them is growing, unabated and effectively isolated from any fluctuations in the U.S. or world economy. Despite debates over the strength (or lack thereof) in the employment market, our students continue to be coveted by potential employers – and hired almost immediately upon graduation. This is why many nations see in Technogenesis a beacon of hope as they strive to follow countries such as Japan, India and China as the next economic Cinderella stories.

We have long worked with DARPA and the Federal Government to carry out research making America safer, and are now at work on a variety of projects that will help secure our nation from terrorist threats (Technogenesis and World Security, beginning page 17). These initiatives seek to develop a new generation of smart, pragmatic security technologies, which include the Center for Maritime Systems’ port security monitoring program, and WINSeC’s work on advanced communications for emergency first responders. Such projects will further Stevens’ reputation for world-class security technology, and spark new Technogenesis spin-off companies.

I want to welcome Dr. Helena Wisniewski, who joined us as Vice President for Institute Technology Initiatives. Her important new role at Stevens is detailed on page 5.

Next year, the new beginnings will continue with the dedication of of the Lawerence T. Babbio Jr. Center for Technology Management (page 20). We look forward with excitement and anticipation to the fruits of the ‘firsts’ and ‘new beginnings’ we are now undertaking.

Harold J. Raveché
President, Stevens Institute

Message from the Chairman

Our adoption and implementation of technology holds broad implications for many of the challenges we now face at home and abroad. Some of these challenges, such as hunger and want, are as old as the human race. Others, such as terrorism, are news on American soil (if not necessarily elsewhere).

With regard to the terrorist threat shrouding today’s world, our research will facilitate security efforts in the near future. As for the enduring concerns of hunger and want, our nation’s history teaches us that technology is a dynamic engine of change. From the railroad to the Internet, technology has generated economic opportunities on a scale that no government policy makers could ever possibly achieve. The world’s hopes and dreams depend on the skills of technically educated young men and women who hold the keys to both our security and prosperity. In the training of such people, Stevens occupies a position of profound responsibility.

I am happy to report that these views are widely held, and that as a result, research funding for Stevens is surpassing all previous benchmarks. Each of the past three years has seen double-digit percentage increases in basic research funding (see page 22). Such increases, suggestive of an ongoing trend, will help secure our standing as a 21st-century engineering resource, and enable us to achieve our Technogenesis goals.

The fruits of Stevens’ current research projects, summarized briefly in this report, are impressive. One of our newest research centers, the Wireless Network Security Center (WINSeC), is well on its way to producing next-generation wireless communications systems and devices (page 12). Professor Rainier Martin’s work with lasers demonstrates how Stevens can lead the world in breakthrough research (page 9). Stevens’ faculty can be proud of what they have achieved in their pursuit of hard-won new knowledge, and I look forward to sharing their future successes with you.

We have concluded the five-year Stevens Capital Campaign, raising $113 million for Stevens’ endowment. This final total far exceeds our original goal of $102 million. I would like to extend my sincere gratitude to all the alumni and the many friends of Stevens who contributed and helped us reach our goal. These funds will aid Stevens in its continuing quest for excellence in engineering education and strengthen our student base and our faculty.

I and the entire Board of Trustees extend our thanks and appreciation to the whole Stevens community – Dr. Raveché, the professors, students and alumni – for striving to do their best this and every year. They embody the spirit that, step by step over the years, has built Stevens into the proud institution it is today. We applaud you, and pledge our continued support.

Lawrence T. Babbio, Jr. ’66
Chairman of the Board of Trustees, Stevens Institute

Technology has profound implications for meeting our oldest (and our newest) challenges. In this, we have a great responsibility.
Technogenesis has become a growing global export, with education and research agreements in place in several countries. Technogenesis transcends cultural, political and geographic boundaries with its innovative, entrepreneurial message. Dr Harald Raveché explains: “Stevens offers a unique integration of engineering science & technology management, versus the more common business & finance management. That integration of disciplines is very appealing to our international partners. Stevens offers those countries programs strategically designed for their economic growth, based on the expansion of business & industry through innovative technologies”.

“In seeking partners, we look for certain characteristics. We prefer working with industries and universities that are not bound by bureaucracy and who value free enterprise, who want to work with business and industry.

“Turkey’s institutions respond to Technogenesis due to this nation’s plan to use IT and R&D to expand its industrial base. Turkey is the only nation with a democratic government and a Muslim majority. Bordering on Iran, Iraq and Syria, Turkey is an important country for the entire free world. Pontificia Universidad Católica Madre y Maestra, the largest private university in the Dominican Republic, and the University of Santo Domingo, the oldest university in the New World, are natural partners. They carry out research in areas of biotechnology, communications and manufacturing. India and China are now rapidly growing in technology and industry, respectively. Therefore, it is important that Stevens be involved in those locations.”

Let a Thousand Ideas Flower: China Is a New Hotbed of Research

China’s growth as a manufacturing giant has been so sudden and intense that it caused a worldwide steel shortage during 2003-4. It appears that its transition to knowledge industries is occurring parallel to—not after—its manufacturing ascendancy. The scale and pace of change today is unprecedented – a similar transition in Japan took decades to achieve.

Technogenesis & educational initiatives worldwide

[1] Exchange programs (science, technology, public policy) (2) Technology incubator(s) and/or master’s programs (3) Transfer education, use (or teaching of) technology in the classroom. (Stevens does this in New Jersey and elsewhere around the U.S. as well.)

[2] Agreements (only recently announced, or in the process of being formalized).

** Cooperative Marine Technology Program for the Middle East. Under this 35-year-old program, founded by Stevens Professor Robert van Eck, Egyptians, Jordanians, Israelis and Americans work together on projects in fisheries and aquaculture, fish process and output control, marine management, climate protection, oceanfood taxes, and wastewater recycling.

[3] A Stevens Master of Science (Telecommunications) degree can be obtained at the Beijing Institute of Technology.
The American entrepreneurial quest to solve real-world problems is at the heart of Technogenesis.

In August 2004, Dr. Helena Wisniewski assumed an important leadership role as Stevens’ Vice President for Institute Technology Initiatives, a newly created Institute-wide position. The position is responsible for the complete Technogenesis cycle at the Institute, including protection of intellectual property, encouragement of new and innovative partnerships, creation of new companies, building strategies to take those companies’ products into the marketplace, and overseeing business services that support research and the international aspects of technology development.

“Our intention is to make Stevens a national asset known for its extraordinary research,” says Dr. Wisniewski, “sought after by government and industry for its technology capabilities and the potential of their commercialization.”

“Technogenesis is integral to achieving this,” she says. “One of my most important goals is to leverage Stevens’ current technological achievements into commercial ventures and into a climate of enterprise and innovation for developing new technology to provide the solutions to problems of critical national need.”

Appreciating Stevens’ wide spectrum of talent, she believes that at least one Technogenesis enterprise can be established annually. To facilitate this and the current growth of research funding, Wisniewski will address several challenges. She intends to have her office provide supportive services for research and patent applications (such as streamlined application and reporting processes) by providing online capability and access to user-friendly databases and templates. With these, faculty will easily be able to update technology patents, manage grant proposals, and comply with import/export regulations surrounding licensing and commercialization.

Dr. Wisniewski has a distinguished record in private industry, government, and academia. Throughout her career, she has worked in positions where these three realms intersect. She has an international reputation in the field of non-linear dynamics, and has played a key role in the field of biometrics since 1987, identifying, funding and creating breakthroughs in face recognition technology. She has received many awards from government, industry, and organizations in recognition for her significant contributions to science, technology and leadership. Past industry positions have included vice president both at the Titan Corporation and ANSER (a not-for-profit research public institute) as well as corporate director at Lockheed Corp. (now Lockheed Martin) headquarters, where she created the first corporation-wide Intranet. She has worked with Congress, drafting appropriations and legislation, and has testified before the Senate on inquiries on emerging technology and her own initiative to put face recognition technology to work finding missing and exploited children on the Internet. She created and managed the Defense Advanced Research Projects Agency’s (DARPA) first math program, growing it to over $30 million within three years, with over 120 participants among universities, government and private industry. At DARPA, she was instrumental in the establishment of companies dedicated to image processing and compression. In academia she was a professor, department head and director of research at Seton Hall University.

In 2001, her entrepreneurial vision was tested when she founded Aurora Biometrics Inc., which deals with data security and identity fraud. The company’s suite of products was based on her patented technology in face recognition. As the chairman and CEO, she raised the first round of funding to start the company, created the business, and marketing strategies, created the brand and grew the business which laid the foundation for Aurora’s success, and subsequently took Aurora public through its acquisition in July 2003.

“Technogenesis was key in attracting me to the position at Stevens,” says Wisniewski. “I find the model very exciting, and I welcome the opportunity to contribute to its growth. I believe that I can make such a contribution, since many aspects of my experience in academia, government and private industry is consistent with the concept, particularly in terms of having gone through the tech start-up process myself.”

The Technogenesis paradigm is intended to bring academia, government and industry back into the classroom, providing a cycle “from the classroom, to research concept, to commercialization and back to the classroom – that isn’t completed in industry or in government labs. This student involvement is what sets Technogenesis apart. It provides a mechanism for students to see beyond the classroom in a very practical manner. This ensures that our graduates continue to become technology leaders, thus completing a cycle of success.”

Near term, Dr. Wisniewski sees the Institute’s many centers continuing to develop as the places where prototypes can be created and their viability in the marketplace tested, giving life to spin-off companies. She also envisions the development of a new major center with an interdisciplinary focus, making use of the vast talent gathered under the Technogenesis umbrella to tackle and solve issues of national importance.
Professor Rainier Martini and his research team are doing breakthrough research with advanced, high-speed lasers. Their work with Quantum Cascade Lasers (QCL) promises to have a wide range of applications in voice and data communications.

“Insofar as the QCL is a semiconductor laser, it’s in the family of today’s laser pointers, but it works in the mid-infrared region, which is not visible light,” said Professor Martini. The QCL was developed ten years ago at Bell Labs, where Martini got his start.

In theory, the QCL is a very good medium for free-space communications, because you can modulate it, (turn it on and off) much faster than standard lasers. Data transmission speed (using any medium) boils down to how fast you can switch your device on and off (which replicates the 1s and 0s of digital’s lingua franca). “The QCL should be able to transmit at a rate of hundreds – or even thousands – of gigahertz,” said Professor Martini. “So, compared to today’s fastest laser system, QCL will be a huge breakthrough.”

Martini’s research has focused primarily on the switch used for the laser. QCL’s breathtaking speed is hobbled by existing electrical switches that are far too slow for it, topping out around 10 gigahertz. Working around this, the Stevens’ research team is using other lasers as switches for the QCL.

“We’re using two or more slower, electrically switched lasers set up in a timed array to switch the QCL laser on and off, in a synchronized pattern,” said Martini. “This system is called multiplexing, where each laser is timed to fire up the QCL – and this is our real breakthrough. In theory this sort of system has been floating around for some time, but we’re the first to have really implemented it and made it work.” The material that produces the laser light in the QCL is sensitive to both electrons – as those used in an electrical switch – and photons – which would be emitted by the laser switch array. The QCL will fire when it is stimulated by photons or electrons – Professor Martini is simply substituting one for the other.

Once the switching issue is resolved, the QCL will help usher in an era of instantaneous communications.

Time-reversed acoustics

Time reversal is a safe topic for sci-fi flicks, but not for research (at least, not if the researchers wish to be taken seriously). Nevertheless, Stevens’ researchers at acoustics’ cutting edge are exploring areas resonant (pun intended) of the granddaddy of all sci-fi themes.

A team of Stevens’ scientists (lead by Dr. Alexander Sutin at Davidson Lab) are making sound waves run backward, in a kind of ultra-focused reverse echo, using a technique known as Time-Reversed Acoustics (TRA) and a device known as a time reversal mirror.

The basic principle of the time reversal mirror is very similar to playing a tape backwards. However, this is not an audio tape being reversed, but a “live” sound wave. The sound wave is directed at the time-reversal mirror, which reverses the acoustic signals, creating a new wave that returns to its source. Unlike a tape, where one has to run through an entire phrase to hear the first words spoken backwards, a time-reversal mirror reverses an acoustical signal as it occurs.

TRA is based on the physics of lossless propagation media, employing a principle called the time-reversal invariance. This invariance states that for any propagated (transmitted) wave (of any type: sound, electromagnetic, etc.), a second wave with exactly the inverse characteristics can be described. (This is similar to pushing your hand into soft clay to ‘describe an inverse’ of your hand.) Since an inverted wave can be described, it can, in theory, also be created. The inverted wave behaves as if time were moving backwards.

A wave propagating from left to right can be changed...
It’s obvious that there are constructive and destructive conflicts. What is not so obvious is that one can cause the other. Despite years of research on the nature of conflict, we knew very little about how teams can benefit from constructive conflict while avoiding the pitfalls of destructive quarrels.

‘For two years we surveyed 94 project teams from large U.S. corporations,’ says Drs. Patricia Holahan and Ann Mooney, professors at the Howe School. ‘What started our interest is the relative lack of research looking at how good conflict spirals into bad conflict. Good conflict occurs when team members talk over their different views on the task at hand. They dispute. Bad conflict occurs when this discussion shifts towards emotional and personal incapability.’

Holahan and Mooney have identified three factors that lead constructive conflict into destructive conflict: trust (and the lack thereof), contentious communication, and behavioral integration, or the extent to which the team engages in mutual and collective interaction.

‘Talking about destructive conflict was like a breath of fresh air,’ said Dr. Mooney. ‘Often executives don’t want to acknowledge the existence of bad conflicts let alone manage or control them. That’s why destructive conflict often has an even stronger impact on teams, because it’s treated like a shameful family secret.’

The researchers’ findings demonstrate how the interplay between constructive and destructive group mechanisms can be severed when conflict is well managed. Since destructive conflict has devastating effects on team decision-making and team performance, techniques that allow managers to minimize the occurrence of bad conflict has immediate implications.

“We have already integrated our findings into coursework on leading project teams and organizational behavior,” said Dr. Holahan. “Our doctoral seminars benefit greatly from this research.”

Laptops and cell phones that only need recharging once a month, automobiles running on renewable fuels, pharmaceuticals and chemicals produced on demand. These are among the possibilities that may emerge from research being done to develop microscopic ‘chemical plants in a box’ (4/100ths of an inch or less in size, producing substances in nanoliters). The New Jersey Center for MicroChemical Systems (NJCMS), lead by Stevens, has partnered with Bristol-Myers Squibb Co., FMC Inc., and Lucent’s New Jersey Nanotechnology Consortium to develop these nano-reactors. NJCMS has quickly emerged as one of the elite vanguard in this field of research.

Some nano- (aka micro-channel) reactors perform functions that are either quite dangerous or impossible in large-scale reactors. In August 2003, NJCMS was awarded its second of two multimillion-dollar research grants from the U.S. Department of Energy. This grant enables the design and development of micro-channel reactors for catalytic hydrogenation reactions. This is of great interest to the pharmaceutical industry, where these endothermic reactions presently constitute a risk of explosion, requiring extensive (and expensive) safety measures. Nano-reactors, by nature, dissipate heat very effectively and hold the promise of enhanced safety for workers, plants, and local communities.

A central component of New Jersey’s economy, the pharmaceutical industry is looking for innovations (such as the microreactor) which will substantially reduce the time and expense required to bring newly discovered drugs to the marketplace. Ron Besser, the NJCMS co-leader, believes that because these nano-reactions happen extremely quickly, whole new categories of compounds may become possible. By avoiding the pitfalls of destructive quarrels, NJCMS is expanding opportunities for doctoral candidates in other areas (in this case, chemical and materials engineering).

Is that really you? Wireless communications are now outpacing wired in growth, and will soon become the predominant means of data transfer. (The term ‘wireless’ is most commonly associated with cell phones, but cell phones are only the leading indicator of this quickly changing paradigm.) Despite this growth, wireless transmissions do not enjoy the privacy and security we take for granted in wired phone lines. These issues will need to be addressed before wireless communications (in all it’s forms) can fulfill its seemingly inevitable destiny of supplanting wired.

Radio waves (used by cell and other devices), by nature, are out there for anyone to tap into. This is both radio’s strength and Achilles’ heel. When you send an email wirelessly, a key encoded the message and it goes to the recipient. The recipient needs a matching key allowing him/her to automatically decode and read the letter. The proper keys to encode and decode must be present at both ends of the communication. Naturally, these keys are transmitted along with the message – and if the message is intercepted, the key likely will be also.

WiNSeC, Stevens’ Wireless Network Security Center, has an insight into the problem. They feel that when information is sent wirelessly, the uniqueness of the radio frequency (RF) environment itself can be utilized to generate a nonreproducible, uninterceptable key.

“We started looking at the RF environment as a means of providing cryptographic keys,” said WiNSeC director and Stevens Professor Paul Kaloday. “It’s easier to intercept the RF signal (than a wired one) because it’s out there in the ether, but at the same time you can actually use the RF environment to provide you with a cryptographic key. What we are trying to do is called symmetric transition characteristics. If I say ‘hello,’ it bounces through a number of distortions and disruptions, and when it gets to you it doesn’t look like ‘hello,’ but a bunch of jumbled signals that have to be reasssembled. If I can capture this as a unique signature, it can become a key that either end can use.”

Technogenesis and world security

The NJ Center for MicroChemical Systems

Time-reversed acoustics (continued)

The nature of constructive conflict

It’s an opportunity to visit with dinosaurs, but it will lead to life-saving opportunities in medicine.
Technogenesis and world security (continued)

Stevens Assistant Professor Suzanne Wetzel is also looking at novel ways to secure computer passwords by employing biometrics. “In order to use fingerprints or retina scans as your password, you need to store that very same data for comparison purposes,” said Wetzel. And, like any other stored password, this can be stolen.” Instead, Wetzel proposes a software-hard-ware combo that recognizes dynamic biometric signatures, such as the way we type, or our voice pattern.

“People tend to use rather simple passwords, because they are easy to remember,” said Professor Wetzel. “The problem is that such passwords are also extremely easy to break. Using a Webster’s Dictionary CD, an attacker can test thousands of passwords in a matter of seconds. On the other hand, if you decide to use a series of random numbers and letters as a password, you’ll probably have to write it down. Again, any password that’s stored can be stolen, or, in this example, lost. And any password that’s lost or stolen is useless.”

Professor Wetzel’s answer to this conundrum makes biometric data a key that’s used to accept your password. Biometric information, such as your typing rhythm, how much stress you apply to the keyboard, how long you touch each key, etc., is very difficult to replicate. Hollywood movies such as Minority Report and The Sixth Day have graphically demonstrated how even someone’s eyeball or fingers could be stolen to circumvent password keys. Stealing or counterfeiting individual biometric idiosyncrasies would be far more difficult, if not impossible, to achieve — and therefore would offer far more security. Under such a system, users would still choose their own password, but the biometric ‘signature’ of, say, the act of typing the password would be used to ascertain the user’s authenticity. (The system now under construction at Stevens anticipates and adapts to normal evolution in one’s typing or voice patterns over time.) So, even if your password is as silly as BUNNY or as transparent as your spouse’s birthday, you can still be safe.

WinSec’s network of networks. The Wireless Network Security Center (WiNSeC) is working on several technologies that will help secure communications networks and ensure that they are utilized as efficiently as possible. Stevens’ will probably center its next new Technogenesis company around these advances.

“The Stevens campus is surrounded by RF grabbers,” said Professor Paul Kolodzy. “Listening nodes that pick up all 802.11 Wi-Fi traffic. Our group wants to dissect the transmission characteristics and better understand how these transmissions function.”

Kolodzy hopes such research will result in what he calls multinationing. Instead of building the next-genera- tion communications network, multinationing optimizes the capabilities of existing infrastructure. It knits very different communications networks together, to act like a single integrated system.

“Emergency response units coordinate their actions via dispatchers, who relay communications verbally over the networks,” said WiNSeC’s Patrick White. “As 9/11 tragically proved, this is a very inefficient way of doing things. WiNSeC is going to resolve the problem enabling seamless, automatic crossovers between networks.”

The WiNSeC team is now building a new generation of communication devices that would facilitate multi- networking. The potential is huge, especially for public safety. “With public safety systems, since there are so many of them out there, you can do one of two things,” said Kolodzy. “Everybody can use the same network — police, firemen, emergency response units, the Army, the National Guard. But can you imagine the mess that would be? The other option is to make devices that can operate over any network, and switch back and forth as needed.” WiNSeC researchers are the first to have attempted to build anything like this new technology. Their success will mean cheaper, safer and faster communication, and greater safety for everyone.

Watch your [computer] language. Viruses, Trojan Horses, Worms. Malware. The conveniences of email and the Internet are tempered with these new hazards. While they are seen as a nuisance and inconvenient by most, they are a major financial threat to banks and credit card companies. Businesses such as eBay have been forced to shut down because of viral attacks, and others have had key data destroyed. Institutions such as the Department of Defense are the caretakers of information that, in the wrong hands, could cost lives. Stevens Professor Adriana Campagnoni is reducing software’s vulnerability to attack by carefully examining the nuances of programming language.

“We’re looking at software from the programming language point of view, to find out what vulnerabilities are embedded within it,” said Campagnoni. "Instead of trying to secure information en route, which is what digital signatures and encryption do, we analyze the code and the overall system, and try to detect where security breaches could take place."

Campagnoni’s work focuses on databases, which have become an essential part of doing business at all levels, and are frequent targets of hackers and intruders. In any given database, there are different levels of security for data, which can include sensitive information such as social security numbers or medical records. Users are not allowed to see such information without authorization. Hackers seek and exploit weaknesses in programs to circumvent their security measures.

Researchers also analyze how information is handled throughout the program, checking whether it’s possible to bypass security gates and access guarded data. For example, a database that does not display the salary of an employee may still reveal whether the employee fits into a certain financial bracket — thereby giving the ‘secure’ information away. With more sensitive data online than ever before, Campagnoni’s goal is to make ‘secure’ databases live up to their description.

Protection, even from our protectors. In an ever-expanding matrix of interconnected data storage areas, private information is harvested, stored, bought and sold — and often, stolen. Secure information stor- age is now as crucial as secure information transfer.

“When some of our personal information is open to the pub- lic,” said Professor Rebecca Wright. “Much of this infor- mation is highly sensitive: social security numbers, credit card numbers, shopping habits, and so on. Companies are concerned about leaking confidential data to com- petitors, and leaked government information could compromise everyone’s security. The ongoing effort that I’m a part of is attempting to determine exactly what information should be considered private and pro- tected, and how to protect that information.”

The effort to which Wright refers is a multi-disciplinary group including mathematicians, engineers, ethicists and philosophers, assembled by National Science Foundation in 2003. The program’s goal is to create a software system architecture that precisely defines how to classify various levels of privacy and security for a broad variety of networked data. Thanks to this effort our personal data is going to be more effectively protected from unauthorized inquiries.

“There has been a shift of focus in cryptography,” says Wright, “which is a core of our research. Pre-9/11, there were already many concerns about privacy but it was mainly companies that were concerned about the dangers of e-commerce. After 9/11, the focus shift- ed to worries about ongoing government surveillance in the cause of identifying and guarding against terrorists. While most people think that such precautions are gen- erally a good idea, they are concerned that data har- vesting could easily go too far.” Professor White’s team is working to ensure that while governmental agencies can efficiently exchange information and communicate in order to ensure our safety, they cannot do it at the expense of our privacy.

• THE YEAR IN TECHNOGENESIS

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WiNSeC and national defense. Just as wireless communications are now central to our knowledge-based economy, they have also become essential to our military security. Some of the Wireless Network Security Center (WiNSeC)’s ideas are being advanced through to startup funds secured from the Defense Department. (This continues a tradition of communications research funded by the military which eventually makes its way into widespread civilian applications, such as the Internet and global positioning satellites.)

Pat White, associate director of WiNSeC, said: “We’re already working with the Army’s Picatinny Arsenal (and their internal venture capital group, Insitech) on far-infrared and multinet technologies. Our multi-network radio came out of a National Science Foundation grant, and the far-infrared visualization came out of DARPA work with Prof. Rainer Martini.”

“The first step for multi-network radio (see page 12) will be to build a prototype that the Army can test in a field environment at Picatinny,” says White. The far-infrared visualization technology takes the form of a camera that can record 10.6 micron infrared signals. Why is this number significant? Because 10.6 microns will penetrate fog, haze and smoke, which block conventional infrared communications signals. WiNSeC believes that they have solved several critical engineering problems that stood in the way of this technology’s practical application, and they can now start work on a high-resolution, 10 megapixel camera for detecting these signals.

With this equipment, an Army commander could use a high-powered CO2 laser to illuminate a base, and obtain highly detailed infrared images at distances of up to 20 miles, in any weather. Police departments could use the system to unobtrusively monitor parks and sensitive areas at night.

War Games. Last year, a private foundation commissioned a study from Stevens’ Howe School on securing the Port of New York and New Jersey from terrorists. The resulting report, Network-Centric Operations Applied to the Campaign Against Terrorism, demonstrates how the School promotes and focuses research at Stevens.

“The scientists are investigating radio waves, secure software and the like, while the engineers are working on ways of knitting these technologies together into operating systems that get information to the right people. What the Howe School does is work on the information, knowledge and decision making structures, which must put into use the technologies that emerge,” says Jerry Hultin, dean of the Howe School.

The project centered on the NY/NJ Port Authority and the myriad private companies and government agencies that are responsible for securing the region. They are spread across a very large area and numerous jurisdictions. “The agencies were already in loose networks, using email, conference calls and working groups, but they seem to be experiencing information overload,” says Hultin. “Many questions remain regarding who makes final decisions and how to get real coordination.”

The report provides an initial look at how these issues can be improved, and Hultin believes that Stevens will be called upon to expand this research. Talks are under way with the Federal Government and its contractors on a substantial research project to put some of the report’s conclusions into practice. The government has already commissioned Howe to carry out an exercise involving a simulated attack on the Port.
Collapsible shipping containers. Port areas all around the world are littered with abandoned cargo containers, since it is often cheaper to dump unused containers at their destinations than to ship them elsewhere for reuse. These mountains of orphaned containers have defied disposal efforts and present substantial contamination and security risks.

In 1991, the Ports of New York and New Jersey handled 1,111,894 shipping containers; this figure had doubled by 2002, reaching 2,200,922 units a year. Even if one percent of the total are abandoned, the number of surplus units left in the region is becoming a major concern. A short ride through any commercial district in New Jersey reveals the extent of this problem. Containers are stacked up behind warehouses, along railroad tracks and at the fringes of port facilities, and soon there will be no place left to put them.

Stevens Professor Sourav Manoochehri envisions a solution: collapsible containers. These advanced designs would be built from composite materials to reduce their weight without compromising strength. Because they are collapsible, companies could more economically ship their empty units.

“We have to come up with a scheme that would give shipping companies a strong incentive to reuse containers,” said Manoochehri. “Our mission is to design a practical, collapsible container that allows five collapsed units to be stacked in the same amount of space as the non-collapsed units currently in use.”

The Department of Homeland Security is aware of this problem. The enormous number of shipping containers entering the U.S. each year prohibits an investigation of most of their contents. But the threat of terrorism mandates that we exert some control over the cargo that enters the country. One fringe benefit of collapsible containers is the assurance that nothing undesirable can ever be “left behind” by those who would cause harm.

Beyond collapsibility, these would be ‘smart’ containers. “We are looking at security issues from the perspective of incorporating surveillance and intelligence gathering technology into transportation systems, such as cargo containers,” said Manoochehri. Initial ideas are focusing on intelligent container systems, which would integrate batteries of sensors into shipping containers. Sensors would allow officials to remotely monitor physical conditions such as temperature, humidity, and structural integrity, as well as every opening and closing of the container. They could even feature motion detectors and GPS tracking.

One of the root causes of the container problem is cost, so a central challenge for Manoochehri’s program is to come up with a design that is economically viable. “Users have to see the economic benefits of adopting our design,” he said. “For instance, if there are any problems with a given shipment, the security check can take hours or even days, and that means substantial losses for all players involved. Our container would provide time and cost savings. Maybe the remote sensors in our containers would even allow users to get some sort of pass because of the level of security they guarantee.”

Manoochehri’s intelligent sensor system could also make decisions independently, based on data harvested from its sensors. For example, it could issue a warning if the temperature or humidity in the container crossed critical boundaries, indicating a fire or hull breach. It could alert security personnel if the container were opened en route to its destination, or allow personnel to sample the chemical characteristics of the cargo, indicating the presence of explosives or other hazardous materials.

“Stevens is accelerating its homeland security and infrastructure protection initiatives,” said Manoochehri. “I think that in the next year we’ll have a prototype design that we will be able to present to industry, in order to find partners for full-fledged production.”

Guarding our waters. On October 12, 2000, al-Qaida terrorists used a small fishing boat to cripple a high-tech missile destroyer worth hundreds of millions of dollars. The attack on the USS Cole raised awareness of terror threats cloaked in innocent guise (the same modus operandi subsequently used on 9/11). Though the Cole attack occurred years ago, many homeland security questions, such as port security, remain unanswered.

A research group at the Center for Maritime Systems, led by Professor Michael Bruno, is investigating technologies to help recognize and prevent threats to naval and shipping vessels posed by small craft. Identifying and classifying small ships in port and offshore areas is a challenge whose solution has, so far, proved elusive. In a busy port, standard radar is of no use for this purpose, but high frequency radar – commonly used for sea mapping – may prove useful.

A vertically-polarized high-frequency (HF) radar sensor, spanning the 3-30 MHz band, is propagated at the surface of the water, which is electrically conductive. Neither rain nor fog inhibits HF, and the signal can travel well beyond the horizon, where the more common microwave radars become blind. These advantages attracted Bruno’s attention, and he realized that HF was well-suited for small vessel detection.

“We’re looking at lots of technology to help us recognize small vessels, but then the question is how to tell if a vessel is a threat,” said Bruno. “Our joint project with the Office of Naval Research combines technology for identifying and tracking small vessels, and for determining whether a particular vessel poses a threat.”

There’s a saying: the future is simply the past that has yet to happen. This encapsulates Bruno’s strategy for identifying the one threatening boat among the thousands of harmless ones. By examining behavioral patterns and analyzing how attacks using small craft have historically been carried out, the researchers can anticipate certain threatening patterns of behavior.

Divers, attaching explosive devices to ships in port or attacking fixed facilities like oil terminals, pose another possible threat. Both the FBI and the Coast Guard have posted warnings regarding potential diver attacks. Although present sonar technology can easily detect a diver’s presence, a human swimming underwater ‘looks’ much like a big fish, or a school of fish.

“We have to learn more about what a swimmer’s acoustic signature looks like,” said Bruno. “That is to say, the sound patterns uniquely associated with a diver, as opposed to a large fish or a flock of diatoms. Are there surface manifestations that indicate the presence of a human swimmer? What are other clues?”

Research will begin with trials in the Davidson Lab’s towing tank, traditionally used for testing ship hull designs. There will be experiments with the Center’s divers, providing broad “signature” samplings of various divers and equipment. Eventually Bruno hopes to build a mechanical diver, or a device that can reproduce the underwater and surface signatures from real divers. (“I don’t want actual divers swimming in the Hudson, due to the currents, traffic and other hazards,” said Bruno.) Once this is accomplished, trials can move out of the tank and into the Hudson River and New York Harbor.
Monitoring local waterways in real time, over the Internet

Watching the waters. There is a surprising amount of demand for information about water conditions throughout the local area, from fishermen and day sailors, to commercial divers and even emergency services. In order to provide real-time information regarding water salinity, the speed and direction of currents, water temperature and more, Stevens and the Center for Maritime Systems have established the NYHOPS online information system. The system relies on 10 sensors (a number that is steadily growing) anchored throughout the region, and several sensors placed on NY Waterway ferries, thanks to NY Waterway President Arthur Imperatore. Numerical modeling allows scientists to bridge data from the various sensors, determine meteorological and hydrological conditions for zones not directly covered by the sensors, and forecast conditions up to 48 hours in advance.

The next link in the chain of sensors established by Stevens will be Glider, a small remote-control submarine that can be sent anywhere in the region to provide more direct investigation of conditions. Glider will make it much harder for polluters to release spills – as soon as the sensor network picks up a spill, Glider is immediately dispatched to the affected area, to discover the source of the spill and predict where it’s heading.

Data from the sensor array is coded into html and displayed on the Internet, with updates every 30 seconds. Uses for this data are legion: charter boat captains and recreational fishermen need water temperature and salinity information to help them figure out where the fish are (changes in water temperature can attract or repel certain species). Every day, ship captains and recreational sailors research wave height and current measurements. Swimmers, surfers and boaters are naturally interested in the temperature of the water, and in wave heights along the coast. For divers, current measurements are essential to safety. This monitoring should lead to cleaner, safer waters.

Some technologies developed at Stevens show such promise that spinoff companies are formed to develop and commercialize them. Here are updates on three of these spinoffs. Each in its own way holds the promise of a cleaner, safer, and healthier world for both ourselves and for future generations.

Plasmion is focused on delivering leading edge thin film applications. Its technology will profoundly impact the display, semiconductor, storage disk and optical communications industries, with implications in the etching/cleaning of electronic structures, surface modification and medical sterilization. Plasmion’s patented technology utilizes a controlled discharge of ionized particles to coat a substrate, resulting in coatings that are thinner, harder and smoother than conventional thin film deposition processes.

Catching up with Technogenesis’ spin-off companies

Plasmion was founded in 2001 to commercialize a range of cold plasma technologies developed at Stevens. Its technology provides the only method for eliminating airborne and surface contaminants that is simultaneously safe, inexpensive and highly effective.

Recently the company began preliminary testing of its technology in medical sterilization systems. It is also working to develop equipment to protect against bio-terror attacks. Its website, www.plasmion.com, was substantially updated and expanded in 2004.

PlasmaSol was founded in 2000 to commercialize a range of cold plasma technologies developed at Stevens. Its technology provides the only method for eliminating airborne and surface contaminants that is simultaneously safe, inexpensive and highly effective.

In 2003 Frank M. Shinneman joined PlasmaSol as its President and CEO. Mr. Shinneman, S.K., was the founding president of Nanodyne Inc., one of the first nanomaterials companies in the United States.

Hydroglobe was founded in 2001 to commercialize water/wastewater purification technologies invented at Stevens. The process, pioneered by Dr. George P. Korfiatis and Dr. Xiaoguang Meng, removes heavy metal contaminants from groundwater and surface water.

A key milestone for this technology was its recent certification under National Sanitation Foundation Standard 61, allowing its use by municipal systems. The process, licensed by Nanodyne Inc., one of the first nanomaterials companies in the United States, was substantially upgraded and expanded in 2004.

Hydroglobe has three products on the market: ActivMet™, FerriMet and MetSorb. www.hydroglobe.com

Formed in 2001, Plasmion’s goal was to commercialize the novel atmospheric pressure plasma technology, capillary plasma electrode discharge (CPED) invented by Stevens Professors Dr. Eric Kunhardt and Dr. Kurt Becker. Recently the company instituted a major web site upgrade, www.plasmion.com, which includes a Flash animation illustrating its processes.

Plasmion, based in Hoboken, NJ, has worldwide representatives including Europe, Japan, Korea and Taiwan.
Since breaking ground on the Lawrence T. Babbio, Jr. Center for Technology Management in October 2001, the Stevens community has watched the six-story structure rise above the campus. Its construction was made possible by Mr. Babbio’s generous personal gift of $6 million, and $18 million in contributions from other Stevens supporters including Verizon, Lucent, AT&T, the State of New Jersey and Stevens alumni. When the center is completed in Spring 2005, it will be a nexus between the worlds of academia and business, fostering the growth and practical implementation of new ideas. The Center will be the new home for the Howe School, and at 95,000 square feet will be the largest structure built on campus in over a decade.

The Campaign for the Babbio Center, launched in June 2004, is raising funds to complete the Center by providing select donors with unique naming opportunities – including the four-story glass atrium, the main auditorium, the technical center, classrooms and piazza areas. These named gifts will spur donors’ active participation in establishing a lasting legacy at this facility. To date, 180 alumni have responded to the campaign, with the majority being previous non-donors. Stevens needs support from its entire community and friends to ensure the Babbio Center’s success. We invite you to participate and identify yourself with our Institute’s – and nation’s – future technological achievements.

• Architectural highlights: The Babbio Center’s most striking aspect is the contrast between its entrance hall’s glass atrium, its main auditorium’s circular steel enclosure, and its overall masonry structure. The interaction of these contrasting shapes and materials results in dynamic interior spaces. Accent lighting draws the eye to the auditorium, while dramatic lighting fills the main atrium, which is visible from across the Hudson.

• Main auditorium: The tiered 125-seat circular auditorium houses an interactive audio-visual system. This will be a premier teaching resource, featuring outstanding sight lines and acoustics for presentations & lectures.

• The Atrium: From the inside, this 60-foot high insulated glass enclosure is a gathering space with a sweeping view of the Manhattan skyline. From the outside, it offers a striking vista to the main campus walkway. The modern, transparent atrium plays smartly off the building’s more traditional masonry features, which anchor the Center in its historic neighborhood.

• Calder’s legacy: In homage to Alexander Calder, the artist and Stevens graduate renowned for his dramatic, free-hanging, balanced iron mobiles (see inside back cover), the fourth floor conference room and adjacent lounge area hang from the atrium’s roof as floating forms high above the main lobby.

• Fifth and sixth floors: The external 25,000 square foot structure of these floors is in place, but will be left unfinished pending receipt of two new $2.5 million donations. These floors have been designed as a flexible space that will be utilized to meet future needs.

• Classrooms: Classrooms have built-in rear-projection systems and comprehensive presentation technology, as well as flexible spaces with upgradable infrastructure for multimedia displays and distance learning.

• Named Babbio pavers, & remembering donors: The east and west plazas, in front of the Center’s entrances, will be connected with the upper campus pedestrian walkways. A ‘Donors’ Circle’ of precast concrete paving stones will be located at a focal point on the north side of the building and connected to Sixth Street. This well-traveled and highly visible location presents an excellent opportunity to recognize our benefactors’ generosity. Inside the building, part of the fifth floor terrace (where VIP events will be held) is also set aside for donor recognition. This space, overlooking the Manhattan skyline, will remember named pavers on raised pedestals covering the terrace floor.

The Babbio Center, shown here in late summer (2004), moves toward its completion. Inset: the site earlier in the summer.
Stevens’ growth mandate is being driven by two macro trends of recent vintage. The first is the fact that the primary product of “industrial” nations today, or soon will be, knowledge and information. As a university, this means (a) that our “product” of higher education (particularly technical education) has reached an historically high level of worldwide demand, and (b) that the job market places a high value on technically-savvy graduates. (Even in the current “soft” job marketplace, most Stevens alumni are hired within a few months of graduation, and virtually all those seeking jobs have one within a year.)

The second macro trend is that technology now drives the world economy. “Smokestack manufacturing” work is highly commoditized and has largely been conceded to countries with low-cost labor. (As these countries develop, they themselves in turn become markets for the “knowledge industries” of “industrial” nations, further driving and accelerating the first trend.) This trend impacts Stevens in its capacity as a research institute. As such, we experience the urgent need for new solutions and products from our partners and colleagues in government and industry on a firsthand basis.

Stevens has been laying the groundwork to fulfill its critical role in a knowledge-based world. In 2004, the Institute completed its renovation of the Walker Gym, part of its commitment to the Student Athlete Program (see the red box, page 25). In 2004 Stevens also committed $10.5 million to begin the renovation of several of its buildings, creating 200 new dorm beds as phase one of its plan to accommodate a 25% increase in students by 2009. 2005 will see the dedication of the Babbio Center (see pages 20 & 21).

As always, the Institute is as committed to the quality of its education as it is to improving its physical facilities. Over the next 5 years, we expect to significantly lower the percentage of applicants accepted (more-qualified admissions being a significant factor in an upgraded educational atmosphere). Likewise, we are working on programs designed to increase the overall cumulative retention of accepted students. And we are cultivating the trend toward increased enrollment of female students, projecting an improvement of the current (historically high) 25% level to 40% by 2009.

Technogenesis® suggests that resources devoted to research can drive and refine the entire educational process. As the charts below indicate, Stevens is mirroring its increased income from graduate education in its research fundraising and expenditures.

Graduate revenue, by school
(Forecasted for fiscal years 2004-6. Dollars shown are in millions.)

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Expenditures for research rooted in Technogenesis®
(Forecasted for fiscal year 2004. Dollars shown are in millions.)

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Facing page: Candid shots of student life. Far right inset shows part of the fall student orientation process.
The men’s soccer team had the most successful season in its 75-year history. Third-year head coach Tim O’Donohue guided his team to a 19-2-2 record and a third-round berth in the NCAA Division III Tournament. Stevens, which defeated Muhlenberg College in the tournament’s second round, finished 12th in the final National Soccer Coaches’ Association of America (NSCAA) Division III coaches’ poll.

The men’s volleyball team, led by coach Patrick Dorywalski, captured the ECAC Division III South Championship, with a 33-4 record. The Ducks finished a perfect 12-0 in the Northeast Collegiate Volleyball Association (NECVA) Metro Division and advanced to the semifinals of the 12-team NECVA Tournament. Junior Brian Woodworth, sophomore Chris Bock and freshman Scott Stoner were selected to the All-NECVA Metro team. Setter Gerard Aro, the lone senior on the team, set a single-season record for assists per game.

The women’s basketball team earned a bid to the eight-team ECAC Division III Metro Championship, the program’s third ECAC bid in five years. Aarcey Cruz finished her women’s basketball career as the school’s all-time leading scorer with 1,701 points – more than any other men’s or women’s basketball player at Stevens. She scored a single-season record 500 points and was selected Women’s Intercollegiate Athletic Conference (WIAC) Player of the Year, Cruz, school’s 2003-04 Female Athlete of the Year, also earned All-Skyline Conference honors for the fourth straight season.

The men’s and women’s swimming teams broke 21 school records at the 2004 Metropolitan Swimming Championships. Junior Emily Schiff turned in the most impressive performance ever by a Stevens swimmer at the Met Championship Meet, as she recorded three top-five finishes and set three school records. The men’s side, sophomore Vadim Gordin shattered four school records: 50-yard backstroke, 100-yard backstroke, 200-yard backstroke and 200-yard freestyle.

Led by sophomore Andrea Chernel’s second-place finish, the women’s fencing team placed fifth at the National Intercollegiate Women’s Fencing Association Championship. Chernel placed second individually in the epee as the Stevens epee fencers finished second as a team behind Division I Temple. In her senior season as head coach, Linda Valkommer-Lynch had five fencers qualify for the NCAA Mid-Atlantic/South Regional.

The men’s lacrosse team earned its fourth straight Knickerbocker Lacrosse Conference title and made its fourth consecutive trip to the NCAA Division III Championship. Fifth-year Head Coach Byron Collins, who guided his team to a 13-3 record and a No. 19 national ranking, led the Ducks to an 8-2 win over Springfield College in the opening round of the NCAA Tournament. The win elevated Stevens into the NCAA quarterfinals for the first time. With a 6-0 record in Knickerbocker play, Stevens extended its conference winning streak to 28 games dating to the 2000 season. Senior Matt Grande was chosen as the conference’s Player of the Year for the second straight season, while freshman Mark Bielicki was selected Rookie of the Year and Collins earned Coach of the Year honors for the second time in his five seasons.

The women’s lacrosse team, under second-year Head Coach Celine Cunningham, went 15-3 for the second consecutive season. Stevens captured its second straight Knickerbocker Women’s Lacrosse Conference championship and improved to 8-0 in two years of conference play. The Ducks also earned their second straight bid to the ECAC Division III Mid-Atlantic Championship. Valerie Barnhart, who earned Skyline Conference co-Player of the Year honors in women’s soccer, was also selected Player of the Year in the Knickerbocker Women’s Lacrosse Conference.

The men’s tennis team captured its first Skyline Conference championship by defeating defending champion Manhattanville in the final of the conference tournament. First-year head coach Jeff Bloomburg guided the Ducks to a 14-5 overall record and a perfect 5-0 mark in conference play. Stevens won its final nine matches and 11 of 12 matches overall after returning from its spring trip to Hilton Head. S.C. Sophomore Steve Su, who was unbeaten in Skyline singles and doubles play, was selected as the conference’s Player of the Year.

The men’s soccer team had the most successful season in its 75-year history. Third-year head coach Tim O’Donohue guided his team to a 19-2-2 record and a third-round berth in the NCAA Division III Tournament. Stevens, which defeated Muhlenberg College in the tournament’s second round, finished 12th in the final National Soccer Coaches’ Association of America (NSCAA) Division III coaches’ poll. The Ducks, who earned their second Skyline Conference championship, were ranked as high as sixth following a school-record 18-game winning streak.

The men’s soccer team captured its fourth straight Skyline Conference championship and earned its second consecutive bid to the NCAA Division III Championship. Fourth-year head coach Jeff Parker guided the Ducks to a 14-7-1 record, marking the third straight season in which the team has won at least 13 games. For the second straight year, Stevens earned a first-round victory in the NCAA Tournament as it defeated Chestnut Hill College 5-0 at DeBaun Field.

Kevin McGinn took over as head coach of the cross-country/track and field programs, guiding the men and women to Skyline Conference cross country titles. The men’s team edged out Kings Point by a point, to win its second consecutive bid to the NCAA Division III Championship. The women’s team captured its first Skyline Conference title by defeating defending conference champion Manhattanville in the final of the conference tournament. Fifth-year Head Coach Byron Collins, who guided his team to a 13-3 record and a No. 19 national ranking, led the Ducks to an 8-2 win over Springfield College in the opening round of the NCAA Tournament. The win elevated Stevens into the NCAA quarterfinals for the first time. With a 6-0 record in Knickerbocker play, Stevens extended its conference winning streak to 28 games dating to the 2000 season. Senior Matt Grande was chosen as the conference’s Player of the Year for the second straight season, while freshman Mark Bielicki was selected Rookie of the Year and Collins earned Coach of the Year honors for the second time in his five seasons.

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President Hal Raveché, on Stevens’ Student Athlete Program: When we started the program, we immediately noticed that their applicants were not only strong athletes, but also above average academically. Our Student Athlete Program stands the general perception of college athletics on its head: It has attracted better-qualified applicants to Stevens. (Our students’ – absent student athletes – SAT scores range from 1190-1390, whereas those in the Student Athlete Program range from 1350-1450.) At present, Stevens has over 300 varsity athletes, and their average GPA is over 3.0.

Athletics offer our graduates a leg up in the professional world as well. When you’ve played a sport at school, you forge a life-spanning relationship with your teammates. You also find common ground with others in your field who were college athletes, no matter what institution they attended. Stevens athletes gain more access to executive and leadership positions because of such networking opportunities, and networking is a factor in one’s career success.

Of course, there are foundational lessons inherent to sports. The discipline imposed by athletics is valuable in this competitive world. The lessons of teamwork carry on into the workplace. Sports give male and female students alike advantages that complement and transcend their degrees.
New Faculty

**Thomas D. Barnes**

Captain, USN (Retired), joined the Davidsohn Laboratory as Director of Strategic R&D. He has served as a consultant to Information Systems and Homeland Security, and held the title of Associate Director, Information Systems Directorate at the Charles Stark Draper Laboratory, Washington, DC. Prior, he served as Military Assistant to the Director of the Defense Advanced Research Projects Agency. His extensive military service includes a tour as Commanding Officer of the USS Peleliu and the USS Guam. Barnes also served as Executive Officer of the USS Constellation. He is a Fellow of the John F. Kennedy School of Government, Harvard University, and holds a Bachelor of Science degree from Abilene Christian University (Texas).

**Dr. Chandra Kintala**

Distinguished Industry Professor joins the Electrical and Computer Engineering Department. Prior to joining Stevens, he served as Vice President, Network Software Research and Realization Center at Avaya Labs (a Bell Labs spin-off). Previously, he was Bell Labs’ Director of Distributed Software Research. Kintala received a Smithsonian medal for SwiFT technology at Lucent in 1998. He is currently Vice-Chairman of IFIP WG1.2, Executive Officer of the USS Constellation. He is a fellow of the John F. Kennedy School of Government, Harvard University, and holds a Bachelor of Science degree from Abilene Christian University (Texas).

**John Nastasi**

Industry Professor, is a practitioner engaged in both critical design practice and design education for the past 12 years, joins Stevens’ Mechanical Engineering Department. The new curriculum at The Product Architecture Lab, developed by Nastasi in conjunction with Prof. Souren Manouchehri, offers a graduate program which stresses the interdisciplinary study of Product Design, Computational Architecture and Engineering with production methodologies and emerging materials; the study of expressive form and integrated functional capabilities; the study of advanced digital media and its impact on design; and the study of interactive and performative environments.

Nastasi is a recipient of Harvard University’s Rice Prize for the Advancement of Architecture and Engineering and numerous other honors and awards. Nastasi holds a master’s degree in Design from Harvard. His design practice, Nastasi Architects, is an award winning and progressive design/build firm in Hoboken N.J.

**Dr. Yang Meng**

joined the Stevens team as an assistant professor at the Department of Electrical and Computer Engineering. Dr. Meng has a M.Eng. in Electrical Engineering from Nanyang Technological University in Singapore and recently completed her Ph.D. in Electrical Engineering at Florida Atlantic University.

Her current research duty focuses on robotics and computer vision, real-time embedded systems, and communications networks.

**Dr. José Emanuel Ramirez-Marques**

who obtained his Ph.D. degree from Rutgers University, joins the Schofer School’s Systems Engineering and Engineering Management Department. Dr. Ramirez-Marques research is directed at lifetime decisions related to systems reliability. He has worked on optimization heuristics for maintaining and enhancing engineering systems; techniques for engineering systems; techniques for assessing component importance and criticality; and systems uncertainty reduction through efficient testing plans.

**Faculty Awards & Achievements**

**Dr. George M. Calhoun**

is also currently serving as the chairman of AirNet’s Audit Committee. Calhoun has more than 24 years of experience in high-tech wireless systems development. He holds a doctorate in Systems Science from the Wharton School at the University of Pennsylvania, as well as a bachelor’s degree from the same university. Calhoun was also recently elected to the Board of INSCI Corp. of Westborough, Mass., leading provider of enterprise content management (ECM) solutions.

**Dr. Adriana B. Compagnoni**

Assistant Professor of Computer Science, is the Principal Investigator for a $420,000 National Science Foundation (NSF) Information Technology Research (ITR) grant, for a project that seeks new ways to approach secure electronic transactions. The research project carries implications for secure electronic transactions in the worlds of finance, banking, electronic voting, online credit-card purchases — even, eventually, robotic communications necessary for the successful exploration of outer space. Compagnoni is a 2001 recipient of a prestigious NSF CAREER Award for outstanding early achievement.

**Henry P. Dobbelaar**

Stevens’ Vice President of Facilities’ Support Services and Professor of Civil Engineering, Jr., P.E., P.P. received the 2003 Educator of the Year Award from The American Council...
Faculty Awards & Achievements (continued)

of Engineering Companies of New Jersey (ACEC). The ACEC has a proven record of success in advancing engineering and maintaining the highest ethical and technical standards in the profession.

The individuals honored have demonstrated engineering excellence at its best, and I join with the Council in honoring them for their work and dedication,” wrote New Jersey Governor McGreevey in a letter to the Council. Dobbelaar is the founding Director of the Graduate Construction Management Program and the founding advisor to Stevens’ Chi Epsilon Society. He is a Fellow in both the American Society of Civil Engineers and the National Society of Professional Engineers.

A.K. Ganguly, Professor of Chemistry and Chemical Biology, received the B. Hershberg Award for important discoveries in medicinally active substances. The award was bestowed by the American Chemical Society.

Dr. Adenivi Lawal, associate professor in the Department of Chemical, Biomedical and Materials Engineering, has received the Stevens Board of Trustees 2004 Research Award. Lawal is a leading researcher at Stevens’ New Jersey Center for Microchemical Systems, which recently received $4 million in grants from the U.S. Department of Energy (DoE) Office of Industrial Technologies. The grant program will demonstrate two novel concepts for producing critical chemicals in a cleaner, safer, more cost-effective and energy-efficient manner.

Dr. Gary S. Lynn, tenured Associate Professor at Stevens in the Howe School, received an award from the International Association for Management of Technology (IAMOT). Lynn was recognized for “being one of the most active and prolific researchers in the Technology Innovation Management field.” Lynn was also named by Business 2.0 as one of the “nine leading management gurus in the country.” Lynn has authored or co-authored four books and over 60 referenced publications on the intersection of technology, innovation, marketing and entrepreneurship. His most recent book, with Dr. Richard Reilly, is Blockbusters: The Five Keys to Developing Great New Products, chronicling the practices of over 700 new product teams, including 49 of some of the most successful products ever launched. Blockbusters was selected as one of the key management publications last year by Manager’s Executive Book Summaries and as one of the 30 best management books published last year by Soundview Executive Book Summaries.

James McCollan, Professor of the humanities and Liberal Arts, has been selected by the American Philosophical Society as the 2003 recipient of its Frederick Lewis Award for his monograph Specialist Control: The Publications Committee of the Académie Royale des Sciences (Paris), 1700-1793.

Dr. Ann Mooney, Assistant Professor in the Wesley J. Howe School of Technology Management, has been granted a Women’s International Science Collaboration Program award to begin a research collaboration with an overseas scientist. The award is bestowed by the American Association for the Advancement of Science, with the support of the National Science Foundation.

Mooney will collaborate with Dr. Jens Grundeit at the Technology University of Berlin. There they will examine the similarities and differences in German and American corporate governance systems, in an effort to develop recommendations for improving practices in both countries.

Mooney conducts research on strategic decision making. She is an ad-hoc reviewer for the Journal of Management and the Academy of Management Journal. Mooney has served as an independent consultant to several Fortune 500 companies, and formerly as an employee of Cooper’s & Lybrand (predecessor of Price-WaterhouseCoopers) and Arthur Andersen. She received her M.B.A. (1996) and doctorate (2000) from the University of Georgia.

Dr. Stuart Tewksbury, the Director of the Electrical and Computer Engineering Department, was recently elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE).

Dr. Suzanne Wetzel, Assistant Professor of Computer Science in the Imperatore School, won an NSF award to establish a degree program in Cybersecurity. The new program reinforces Stevens’ capacity in information assurance and computer security education, by developing interdisciplinary cybersecurity degrees on both the undergraduate and the graduate level.

Wetzel’s team has discovered “stealth attack” methods of disrupting and draining power from individual nodes within an “ad hoc” wireless network – i.e., a network that one “connects to” as a visitor as one moves physically with one’s mobile computer from location to location, without a dedicated access point.

Wetzel joined the Stevens faculty in 2002. She received her Diploma in Computer Science from the University in Karlsruhe (Germany) and a doctoral degree in Computer Science from Saarland University (Germany) in 1998. Subsequently, she worked at DaimlerChrysler Research (Stuttgart, Germany), Lucent Technologies/Bell Laboratories (Murray Hill, USA) and RSA Laboratories (Stockholm, Sweden).

Her research interests are in cryptography and algorithmic number theory. In the field of cryptography, her research is focused on wireless security, secret sharing, privacy, and biometrics, and her contributions range from analysis to protocol design. In algorithmic number theory, her research is centered on lattice theory, in particular on developing new algorithms and heuristics for lattice basis reduction.
Dr. Rebecca Wright, professor of Computer Science, is the Principal Investigator for an $808,000 grant through the National Science Foundation. The project, entitled “Information in a Wired World,” will span five years of research on the topic of sensitive information in a networked global environment.

Wright’s project is part of a multi-disciplinary project that takes place at Stevens and at 12 other campuses worldwide. It is made possible by the “Information T echnology Research Initiative” of the National Science Foundation. The award was initiated in 2001 to recognize and honor the country’s most notable online learning schools and programs. Sloan-C is a consortium of nearly 450 institutions and organizations committed to quality online education.

“Significantly, this award shows that smaller universities can become powerhouses in online education,” said Robert Ubell, dean of Stevens’ new School of Professional Education and the founding director of WebCampus.

The WebCampus program was launched in 2000, with 23 enrollments. Since then, it has come a long way. In the last four years it has achieved over 4,000 enrollments worldwide with students logging on from 37 states and 28 countries. This year alone, enrollments exceeded 2,000. Revenue generated by WebCampus grew from $48,000 in 2000 to over $3.2 million in 2004. 2005 revenue is projected at nearly $5 million.

WebCampus today employs 60 full-time and adjunct faculty, who participate in frequent, in-depth seminars to ensure quality of course delivery. It began with just three courses; today it offers more than 160.

Stevens ranks as #1 in The Princeton Review’s Top 25 Most Connected Campuses. This ranking acknowledges Stevens’ national superiority in wired and wireless technology for students on campus. To identify the colleges on the list, The Princeton Review collated responses from more than 100,000 college students, as well as data from campus administrators. Criteria included the student/computer ratio, wireless access on campus, the breadth of the computer science curriculum, and comments from campus students.

Being at the forefront of connectedness is not new for Stevens. In 1982, Stevens was the first institution in the US to require all undergraduates to own and use a PC. In the mid-1980s, Stevens provided network access from all residence hall rooms to the campus network and the Internet, and in the late 1990s, Stevens completely replaced all networking within its residence halls to support gigabit-speed networking.

The Executive Masters of Technology Management (EMTM) Program at the Wesley J. Howe School of Technology Management has again won the Academic Leadership Award of the American Society of Engineering Management (ASEM). Stevens’ EMTM program was the first graduate program to receive this prestigious award in 1999, and is the only program to have received it twice.

The EMFM Program was developed as part of the Stevens Alliance for Technology Management (SATM).

SATM is an education-industry alliance of high-tech companies and government research labs in the New Jersey area. SATM partners include AT&T, Lucent Technologies, Honeywell, Allied Signal, Telcordia, the U.S. Army, Picatinny Arsenal, Verizon and the U.S. Army Communication, Electronics, and Command (CECOM), based in Ft. Monmouth, N.J.

The Howe School was also designated a Center of Excellence in Business Process Innovation by SAP, the leading provider of business software solutions, and IDS Scheer North America, the leading provider of business process excellence services and tools. Stevens joins a network of universities in the Institute for Business Process Innovation that includes Queensland University of Technology (Australia), George Mason University, Widener University, Ecole Polytechniques Montréal, and the University of Saarbruecken (Germany).

‘Business process innovation’ addresses the definition, implementation, execution and improvement of corporate processes – in other words, the entire life cycle of a given business process.

“This designation reflects our continuous effort to teach our students relevant and timely concepts that will drive tomorrow’s enterprise infrastructures,” says Jerry MacArthur Hultin, dean of the Howe School. “SAP and IDS have recognized both our educational and research activities in the areas of Business Process Management, Workflow Automation, and Process Innovation.”

In 2003, WebCampus won the nation’s top award for Best Online Learning University. The prize is bestowed by the Sloan Consortium, a prestigious group of learning institutions funded by the Alfred P. Sloan Foundation. The awards were initiated in 2001 to recognize and honor the country’s most notable online learning schools and programs. Sloan-C is a consortium of nearly 450 institutions and organizations committed to quality online education.

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There are many reasons why business and government leaders choose to work with Stevens.

**Professional education.** Most businesses, at some point, are confronted with the fact that their employees need tailored educational programs simply to keep pace with competitors. For years, Stevens has worked with global companies such as Pfizer (as well as smaller firms) to give employees the knowledge they need to advance their companies’ agendas. Because better-prepared employees tend to advance their own careers, offering such training also acts as an incentive. Customized educational programs that meet the growth objectives of companies are the most common reason business comes to Stevens.

**New employees.** Another reason business comes to Stevens is to seek new hires. The relationships we build with companies enables our students to better understand a corporation and its culture (and vice-versa) long before they commit to an employer/employee relationship. Our students are in demand by a wide variety of businesses, ranging from engineering and science-oriented companies to financial institutions and government agencies.

**New products and procedures.** In rapidly-growing, technologically-dependent fields such as wireless communications, Stevens is anticipating the technical challenges ahead. Our research center, WiNSeC (pages 9 & 11-15 covers our communications research) is developing innovative solutions for wireless companies who see new opportunities in offering emerging products and services to their client base.

Stevens’ research centers and Technogenesis companies are also working on breakthroughs in manufacturing processes that will have significant bottom-line impact for many businesses. The Center for MicroChemical Systems, for example, is developing cheaper, safer ways of handling catalytic hydrogenation reactions (page 11), a staple procedure for major pharmaceuticals.

The Stevens enterprise Plasmasol (page 19) is developing more efficient, less polluting methods related to the manufacture of electronic devices.

Companies in the business of selling technology-based products and services often see demands from clients that are just beyond the range of their capabilities. Here, the ability to improve on existing products or services (or introduce new ones) is a vital competitive edge. Stevens works with companies’ in-house product development and research teams to focus and supplement their efforts with the Institute’s research and other resources.

**New frontiers.** The highly competitive global economy demands innovative products and services based on unique capabilities, such as in the area of homeland security. For example, today’s military is increasingly committed to maintaining and expanding our armed forces’ technical edge. In such cases, Stevens’ research helps enable devices and services that did not previously exist, yet must be reliable even under the most unforgiving of circumstances. Such work hones our researchers’ skills at breaking down barriers to knowledge, and Stevens has worked closely with the military throughout its history.

Moreover, Stevens is working with other government and business leaders on emerging frontiers of security. How do we import more goods than ever before in our history, while maintaining the shipping cost efficiencies we’ve achieved over the years, without exposing ourselves to today’s terrorist threats (page 16)? The answers can only come through innovation. How do we monitor our waterways, our shores, our communications, without infringing on personal rights of privacy (pages 17-18)? We are working with concerned officials whose duty it is to find solutions for these pressing security issues.

Stevens can make a difference for you. Contact us: Stevens Institute of Technology, Office of University Communications, 201-216-5687.