HOSPITAL
FOR SPECIAL
SURGERY:
SPECIALISTS
IN MOBILITY

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REPORT

Horizon

Transforming Patient Care Through Science and Technology

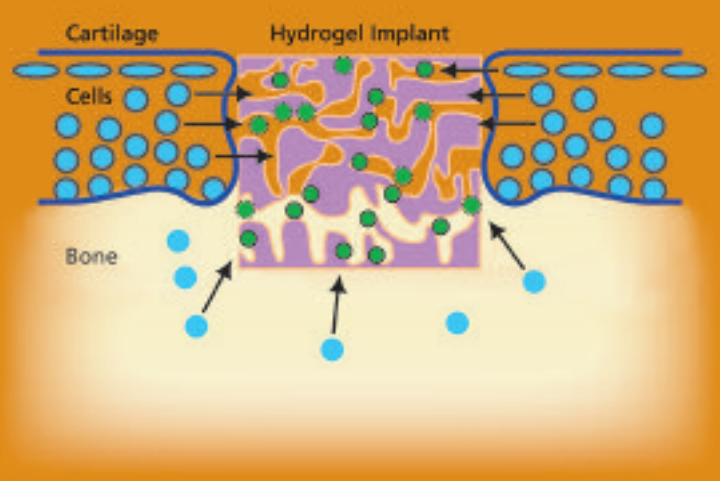
Horizon

In this issue:

On the Cover:
A hydrogel sample is ready for analysis to determine its potential as a material to repair cartilage that lines the surface of the knee joint.

Opposite page:
Suzanne Maher, PhD, is one of many scientists at Hospital for Special Surgery seeking to solve the challenge of repairing damaged cartilage and other soft tissues.

Diagram below:
With a hydrogel implant placed into a cartilage defect, growth factors attract cells that generate new and healthy tissue.



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Armed with the latest technologies and clinical advances, the physicians, scientists, and health professionals at Hospital for Special Surgery confront the challenges of musculoskeletal conditions today, while pursuing pivotal research that will bring the breakthroughs of tomorrow.

During his first climb of the morning on Ragged Mountain in Connecticut, Graham Seaton lost his footing and fell 35 feet, landing with full force on his right leg. The October 2005 accident left him with catastrophic fractures below the knee. But today, Mr. Seaton is back mountaineering thanks to the skills and novel approaches to complex orthopedic challenges he found at Hospital for Special Surgery.

Mr. Seaton is one of thousands of patients each year who benefit from the incredibly focused expertise and depth of experience that only a specialty institution can provide. "Hospital for Special Surgery represents the unique integration of a world-class hospital and research institute with the eventual goal of eradicating musculoskeletal conditions through scientific discoveries," says Stephen A. Paget, MD, Physician-in-Chief and the Joseph P. Routh Professor of Rheumatic Diseases in Medicine. "When you place the world's best and the brightest in such a productive and stimulating environment, progress is assured for our patients."

A New World in Orthopedic Surgery

Nearly 18,000 orthopedic procedures are performed each year at Hospital for Special Surgery. This wealth of experience is the source of many of the advances in techniques and technologies now in use around the world.

In recent years, orthopedic surgery has pursued less invasive procedures to address a range of conditions – from disabling joint problems, to sports injuries and spinal disorders, to major trauma. Arthroscopic procedures, once reserved for repairing soft tissue injuries in the knee and shoulder, have been expanded to include applications for certain hip conditions, such as labrum tears around the hip joint, instability, and synovial disorders.

The once standard 12-inch incision for a total knee replacement has been virtually replaced by surgery performed through an incision of only three to four inches long. With hip replacement, the incision has been reduced from 10 inches to four or five. "Although the most noticeable evidence of these newer joint replacement techniques is the smaller incision, the real value of these procedures is in how well patients do following the surgery," says

Thomas P. Sculco, MD, Surgeon-in-Chief, and the Korein-Wilson Professor in Orthopedic Surgery, who pioneered the modified technique for hip arthroplasty. "Pain relief and improved mobility are accompanied by the benefits of less trauma to the muscles and soft tissues, less blood loss during surgery, and an easier rehabilitation."

In addition to new techniques for joint replacement, our surgeons and bioengineers continue to develop and refine surgical tools and joint implants. Novel devices and smaller instruments are making less invasive surgery possible, while improvements in materials and implant designs are adding durability and flexibility

Above: With arthroscopy, a minute fiberoptic camera is inserted through incisions as small as an eighth of an inch to view the inside of a joint for diagnostic and treatment purposes.

Left: Dr. Timothy Wright and his colleagues in the Department of Applied Biomechanics in Orthopedic Surgery are pioneers in the design and development of joint implants.

of motion. “Implant wear is influenced by patient weight and activity level,” says Timothy Wright, PhD, F.M. Kirby Chair in Orthopedic Biomechanics. “Our surgeons and engineers are evaluating various implant-bearing surfaces such as metal-on-metal, ceramic-on-ceramic, and cross-linked polyethylene. Our goal is to provide patients with low-friction, low-wear joint replacements that can withstand a rigorous lifestyle.”

Among the surgical tools that have been developed here is customized instrumentation to lessen trauma to tissue during joint replacement surgery. These include an angled reamer that can be inserted without putting too much tension on the skin when surgeons prepare the bones for the implant, and a hemisphere – a small cutting device that makes it easier to carve out a new hip socket.

Among the concerns of patients undergoing any surgery is the possible need for a blood transfusion. The Hospital is a leader in developing and incorporating into practice the latest blood conservation techniques. “Blood management is an important consideration in any surgery,” says Gregory A. Liguori, MD, Anesthesiologist-in-Chief. “To minimize intraoperative blood loss and the potential for transfusion with donated blood, we use a number of approaches, including intraoperative autologous blood recovery systems, often called cell saver machines.”

The cell saver machine is used to collect blood lost during the operation, filtering and washing it so that it may be given back to the patient. This technique is commonly used when significant blood loss is expected, such as during spine surgery.

Utilizing this technique, the Hospital has been able to reduce the need for blood transfusions from the blood bank by 97 percent.

Hospital for Special Surgery leads all hospitals in New York State in surgical infection prevention. Contributing to our excellent record is a newly constructed, state-of-the-art central sterile supply unit that serves the Hospital’s operating room suites. Features of the new unit include six sterilizers, of which four are floor-loader, walk-in sterilizers, and an automated system that tracks the processing and sterilization of approximately 600 instrument trays a day. “Every one of our trays is barcoded and indexed for inventory control,” says William McDonagh, RN, Assistant Vice President of Perioperative Services. To further maintain the integrity of the sterile environment, dedicated elevators – one on the decontamination side and one on the sterile side, accessible only to perioperative staff – transport trays directly to and from the operating rooms.

In the new Central Sterile Supply unit, the average turnaround time, from the time an instrument tray goes into the decontamination area from the OR through the washer to the sterilizer and then wrapped, is approximately three and a half hours.

Advancements in Radiology

The Hospital has one of the most technically advanced musculoskeletal imaging departments in the country. It is one of only a few to use an open gantry magnetic resonance imaging camera in which radiology specialists can image virtually any sized patient in any position. The Hospital for Special Surgery Musculoskeletal MRI Center, with five MRIs and two more sited and pending acceptance testing, will be the largest academic MR imaging center in the nation dedicated to musculoskeletal

medicine. And, with the recent opening of the new Center for Musculoskeletal Ultrasound, the Hospital is realizing the multifaceted potential of ultrasound for both diagnostic and therapeutic applications.

"The new Center enhances diagnostic capabilities and treatment options for patients with musculoskeletal disease," notes Helene Pavlov, MD, Radiologist-in-Chief. "It features three ultrasound rooms that capture the real-time motion of muscles and tendons and provides exquisite resolution for more well-defined images. The equipment and the faculty expertise allow us to offer innovative treatments, including image-guided therapeutic injections for conditions such as tendinitis and arthritis."

Dr. Pavlov and her colleagues are also at the forefront of using MR imaging for early diagnosis of osteoarthritis. "We're looking at cartilage, which cannot be seen on a routine X-ray," she explains. "By visualizing almost to the microscopic level of cartilage striations, we can determine if the cartilage is starting to erode or becoming compressed long before surgical treatment or long-term management may be necessary."

New Horizons in Research

With a complement of nearly 100 basic and clinical scientists, Hospital for Special Surgery's robust research program is producing valuable data and information at every level and in every orthopedic and rheumatological specialty – helping patients today and laying the foundation for new therapies to come.

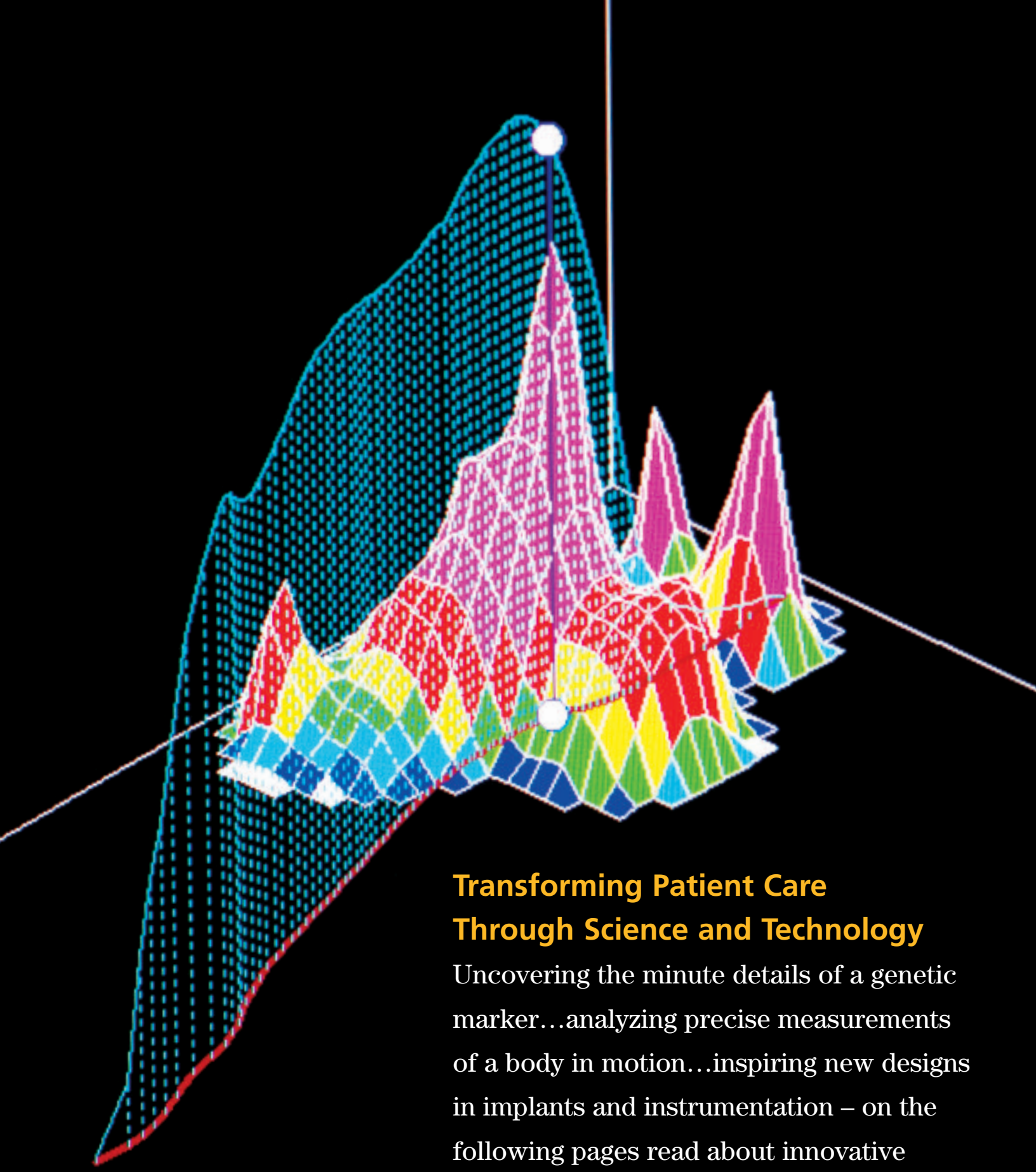
"Together, we are advancing Special Surgery's research mission to translate basic science findings into new ways of treating and preventing musculoskeletal conditions," says Steven R. Goldring, MD, Chief Scientific Officer and the St. Giles Chair in Pediatric Genetic Research. "We are committed to expanding our interdisciplinary research efforts and developing a continuum of clinical and basic science that fosters translational research."

As part of this commitment, the Hospital welcomed Carl Blobel, MD, PhD, in 2004 as Program Director of the Research Division's Arthritis and Tissue Degeneration Program, and the Virginia F. and William R. Salomon Chair in Musculoskeletal Research. Dr. Blobel's research into a family of enzymes called ADAMs – with particular attention to their role in rheumatoid arthritis and the formation of new blood vessels – is furthering the understanding of the critical roles that molecules play in tissue degeneration and regeneration.

Left: During a spine surgery, Piergiuseppe Roma, RN, uses the cell saver technology to clean the patient's blood for retransfusion.

Below: The work of Gisela Weskamp, PhD, Associate Scientist, and Dr. Carl Blobel and their identification of an enzyme that appears to play a pivotal role in the development of rheumatoid arthritis, was recently published in the prestigious scientific journal *Nature Immunology*.

"We incorporate our current experiences with patients in order to assure, through scientific discovery, better outcomes for others in the future," adds Dr. Paget. "It is just this scientific process that leads to continued progress and eventual cures." ■



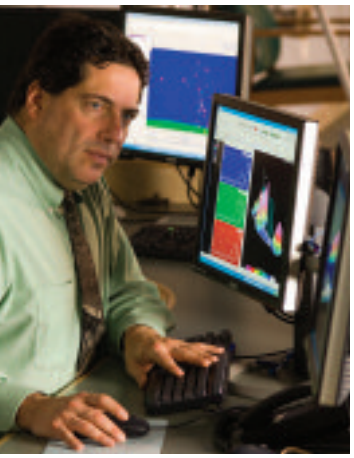
Transforming Patient Care Through Science and Technology

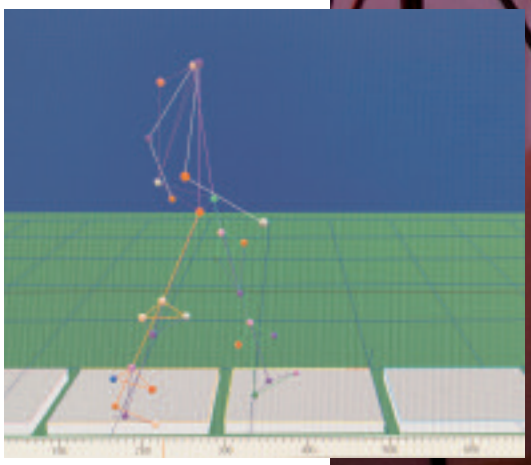
Uncovering the minute details of a genetic marker…analyzing precise measurements of a body in motion…inspiring new designs in implants and instrumentation – on the following pages read about innovative efforts at Hospital for Special Surgery to improve the lives of our patients.

Analyzing a body in MOTION

When a person has foot pain, chances are there will also be a problem in another joint. "Malalignments rarely travel alone," says Howard J. Hillstrom, PhD, Director of the Leon Root, MD, Motion Analysis Laboratory. "If you evaluate the kinetic chain – from the foot to the knee, hip and pelvis – you can usually find a primary, correlated, and compensatory effect."

Using high-tech and unique assessment tools, Dr. Hillstrom and his team are contributing important knowledge about how a pathology is manifested while a patient is in motion.





Dr. Howard Hillstrom (far left) and Sherry Backus, MA, PT, Senior Research Physical Therapist (right), evaluate movement in patients with various pathologies. The stick figure image (above) represents a patient who is bowlegged and walks abnormally – placing excessive stress on joints, which can damage cartilage and related soft tissues.

Measuring the pressures beneath one's feet enables staff to quantify how someone walks, runs, or stands. By obtaining a comprehensive picture of the origin of the problem and why it progresses, they can then define how to treat it.

The Motion Analysis Lab, along with the Biomechanics Lab and the Soft Tissue Engineering Lab, examines mobility issues from different perspectives. "We look at the problem at the in vivo scale with different technologies and techniques," says Dr. Hillstrom, "but each lab brings another piece of the puzzle to the table – providing analysis, for example, of injury-induced osteoarthritis at the joint level, the tissue level, and the chemistry level. The goal is to integrate the information to arrive at new and more creative treatments – surgical or conservative – that will help the patient move with greater mobility."

Prior page: This three-dimensional, multi-colored display of pressure beneath the foot during walking aids mobility specialists in pinpointing the abnormal biomechanical function within the lower extremity.

Dr. S. Robert Rozbruch evaluates the progress of John Kuklis as his wife, Charlene, looks on. Mr. Kuklis' significant foot and ankle deformity and leg length discrepancy was caused by a trauma decades earlier and made walking difficult. Dr. Rozbruch performed ankle reconstruction and deformity correction using the Ilizarov method.

Lengthening LIMBS one millimeter at a time

A rock climbing accident left Graham Seaton with a shattered ankle. Despite initial treatment, he was left with a destroyed ankle joint and limb threatening bone loss. Dr. S. Robert Rozbruch and Dr. David S. Levine performed a limb salvage reconstruction that included an ankle fusion and simultaneous leg lengthening. Today, Mr. Seaton is back on the mountain, skiing, mountaineering, and ice climbing.

One inch, two inches…even 12 inches of new bone can be grown to address limb length discrepancies, thanks to amazing techniques pioneered by S. Robert Rozbruch, MD, Chief of the Adult Limb Lengthening and Deformity Service.

Limb length discrepancies may result from trauma, growth deformity, disease, or a congenital defect. Limb lengthening and reconstruction techniques are used to replace missing bone and to correct deformed bone segments in both the upper and lower extremities. Surgeons cut and gradually distract the bone to enable new bone to grow without injecting or inserting any synthetic material or performing bone grafts. The bone is stabilized using external fixation frames or implantable internal devices.

"A computer assisted deformity correction system enables us to make very precise and simultaneous corrections in three planes," says Dr. Rozbruch.

Dr. Rozbruch's LATN (lengthening and then nailing) procedure has drawn national recognition. With this approach, a rod is inserted into the bone marrow cavity and serves as a stabilizing mechanism while the bone heals. What's particularly exciting, says Dr. Rozbruch, is that by substituting internal fixation at the end of the lengthening phase, the frame can be removed much sooner and bone healing is accelerated.

"Our job is to straighten, lengthen, and make the body symmetrical," says Dr. Rozbruch. "The bone grows naturally, and by pulling it apart very, very slowly – a millimeter per day – it regenerates by about one inch per month."

And there's no time limit for performing the procedure. Dr. Rozbruch has cared for patients with traumas dating back 20 years who come from the era of traction, and he has been able to help them. *(More online www.hss.edu/horizon)*

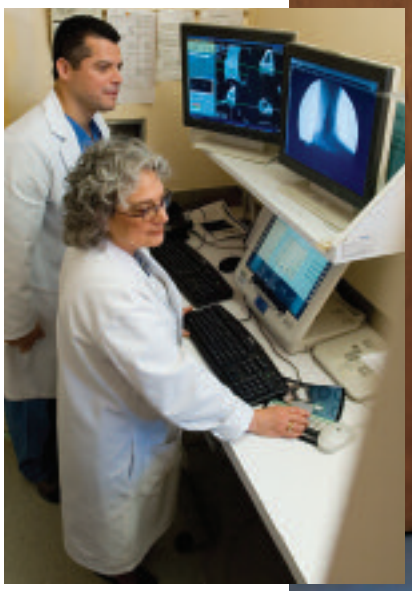
STANDING up for digital imaging

The Department of Radiology and Imaging, which is recognized worldwide for musculoskeletal, orthopedic, and rheumatologic clinical and research imaging, is once again at the forefront of applications for musculoskeletal imaging that are likely to prove a breakthrough for clinical care. In collaboration with Philips, the Department is helping to develop a new use for three-dimensional axial weight-bearing fluoroscopy, which provides digital X-ray images of a patient's pathology while standing. Hospital for Special Surgery is the only site in the country applying this technology for orthopedic diagnostics, which was originally approved by the Food and Drug Administration for use in cardiac studies.

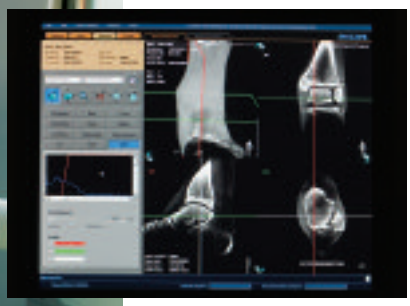
"This is the first time we can look at a patient's knee or ankle when it is in a weight-bearing position and construct a 3-D representation of the body part in an X-ray mode," says Helene Pavlov, MD, Radiologist-in-Chief. While a CT scan – which can only be performed with the patient lying down – gives important information, upright fluoroscopy provides what a CT scan cannot – the effect of forces on a joint. "This is truly emerging technology, and it is providing a more comprehensive evaluation of pathology that was not previously available to us."

An image taken of a joint while the patient is standing reveals very different information from an image of a joint at rest. For example, if an image of a knee joint is taken while the patient is supine, it could show adequate space in the joint. But the joint space narrows considerably under the load of standing weight, providing some very telling diagnostic information about cartilage degeneration and the cause of pain.

"Subtle misalignment in a joint might be missed when the patient is imaged lying down," adds Dr. Pavlov, "so applying gravity holds enormous potential."



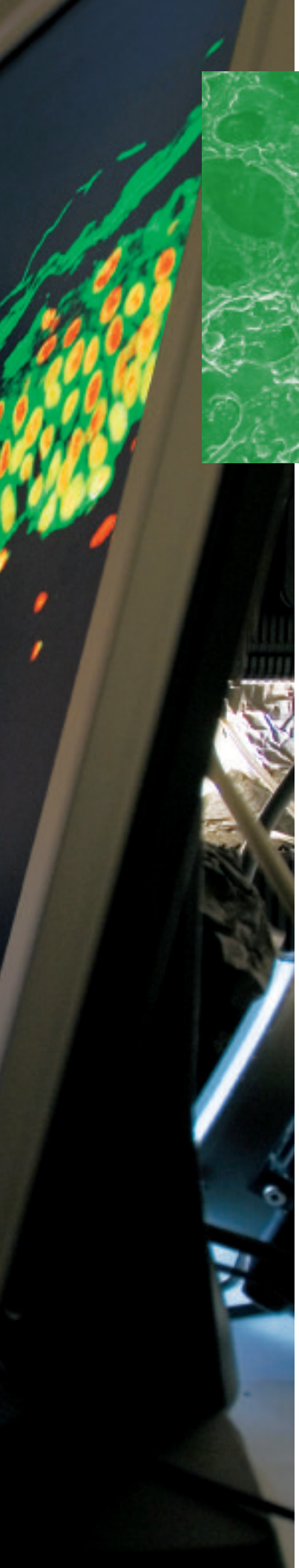
Above: Dr. Helene Pavlov and Mario Solano, radiology technologist, review images taken with the new weight-bearing 3-D fluoroscopy unit. Within seconds, images taken of the patient while standing can reveal important information of a patient's pathology, not otherwise evident.

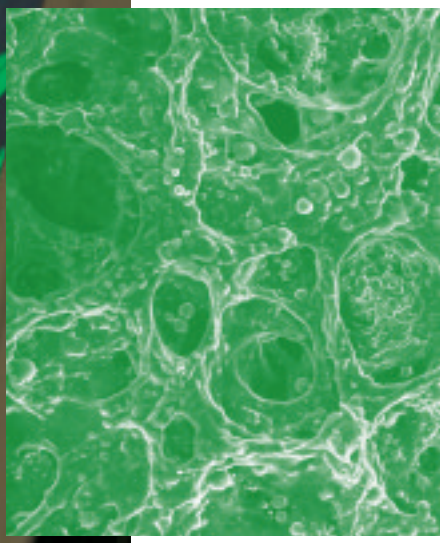


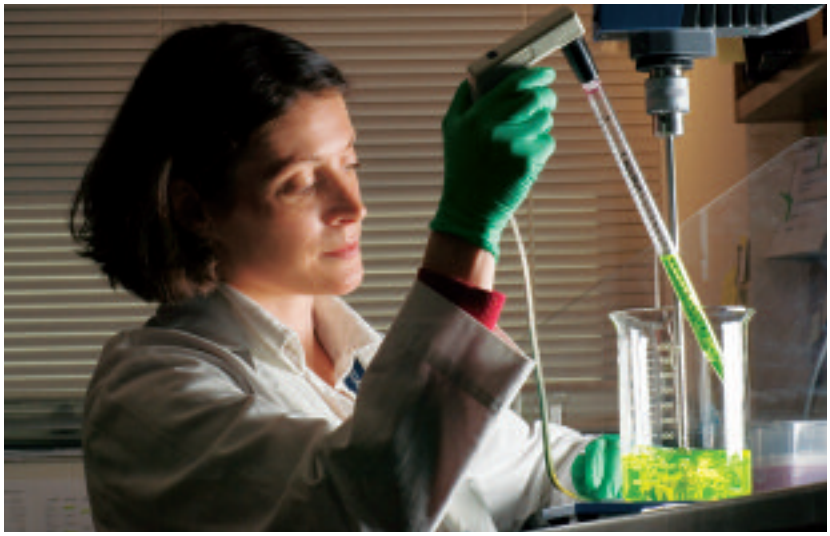
Above: These 3-D images reveal how weight-bearing forces on an ankle joint provide important diagnostic information.

Left: Teresita Leynes, MSN, NP, Assistant Director of Radiology and Imaging, demonstrates how the new imaging application is used for diagnosing ankle disorders while standing.

Working together to heal TISSUE







Above: A porous scaffold may provide tissue engineers with a means for repairing damaged cartilage.

Above, right: Dr. Suzanne Maher prepares a solution that will then be solidified and studied for its potential as a hydrogel scaffold.

Left: Dr. Marjana Tomic-Canic's laboratory has identified a pathogenic marker that is present in pressure ulcers, diabetic foot ulcers, and venous ulcers. "We rely on these molecular markers to demarcate bad tissue from good," she says. This is the first molecule to be discovered that actually prevents wounds from healing.

On the fifth floor of the Hospital's Research Building, scientists in the Tissue Engineering, Regeneration, and Repair (TERR) Program are tackling some of the most serious clinical challenges through their work at the bench. Among them are Marjana Tomic-Canic, PhD, Director of the Laboratory of Tissue Repair; Suzanne Maher, PhD, who heads the Laboratory for Functional Tissue Engineering; and Peter Torzilli, PhD, Director of the Laboratory for Soft Tissue Research, who oversees the overall TERR program.

While they each pursue different types of tissue injury, they share a common interest in the role of inflammation, which is present in any wound whether it's to bone, cartilage, tendon, or skin. Since these tissues share similar composition, the cellular processes that guide their repair mechanisms have many common properties and similar therapeutic approaches may be applicable.

Dr. Tomic-Canic is seeking solutions to the widespread problem of pressure sores and skin ulcers that are among the leading causes of mortality in hospitalized elderly patients. "Some of the breakage in skin is linked to decreased vasculature, and some is due to pressure," says Dr. Tomic-Canic. "We're trying to understand how load affects tissue integrity of skin, which molecules are involved, and why this evolutionary protected mechanism becomes impaired in elderly people or those who have metabolic diseases, such as diabetes."

Dr. Tomic-Canic is now adopting a model system that was developed by Dr. Torzilli's lab for testing cartilage that will enable her to put load on skin and test its mechano-biological

Dr. Chris Chen and Dr. Peter Torzilli mechanically load cartilage tissue specimens to look at how the cells respond to being compressed by a system that simulates a joint bearing weight during walking. They are specifically interested in how the cartilage cells react to excessive load.

properties as a model for pressure ulcers. “We stretch that skin after load and also look at molecules and enzymes that may compromise the integrity of skin,” she says. “Understanding these initial changes triggered by load in skin will allow us to understand how a pressure ulcer develops.”

Nearby, Dr. Suzanne Maher is investigating porous hydrogels to replace damaged articular cartilage. “Our goal is to provide a matrix with mechanical properties similar to that of articular cartilage in which embedded growth factors stimulate the proliferation and migration of healthy cells to the affected areas,” says Dr. Maher. To create the ideal hydrogel scaffold involves preparing solutions that are stirred at different speeds for different times, using a range of additives. The solution is then poured into molds and subjected to freezing cycles to solidify it.

“Once brought back to room temperature, we can slice the material, look at the structure under a microscope, and then mechanically test it,” she says. “We can change the variables during preparation of the solution to understand how they change the structure and mechanical properties of the scaffold. There needs to be a balance between having the scaffold porous enough so the cells can get in and yet not too porous so it is mechanically weak. Ultimately, we hope to generate a computer model that will facilitate this scaffolding process.”

Dr. Peter Torzilli and Dr. Chris Chen are interested in determining how cyclic loading similar in a joint affects cells in the articular cartilage. “By mechanically overloading the cartilage, we’re able to produce in the tissue specimen a response in a short period of time that is similar to what happens in the long-term damage that occurs in osteoarthritis,” says Dr. Torzilli.

Of more interest, Dr. Torzilli and his colleagues have recently found that normal walking is beneficial in reducing inflammation. “Cyclically loading cartilage at the level similar to normal walking can inhibit degradative events due to joint inflammation,” says Dr. Chen. “This implies that if you walk daily, you may have less chance of developing an inflammatory degradation in cartilage. But there is a balance. When you have too much loading it could wear out the tissue – but the right amount is actually beneficial.”

Navigating the FUTURE of orthopedic surgery

In the Hospital's state-of-the-art computer assisted orthopedic surgery laboratory, Andrew D. Pearle, MD, is playing a key role in developing the burgeoning arena of surgical navigation technologies that will help define the future of orthopedic surgery.

According to Dr. Pearle, Clinical Director of the Hospital's Computer Assisted Orthopedic Surgery (CAOS) Center, surgical navigation is akin to having a Global Positioning System in the operating room, where surgical instruments and a patient's anatomy are simultaneously tracked with a mapping system.

"In the OR, we use an optical tracking system in which reflective markers are mounted on surgical instruments and implants, and affixed to the patient," explains Dr. Pearle. "In this way, we can visualize the instrumentation and anatomy to determine where to prepare the bone and place an implant."

As an orthopedic surgeon, Dr. Pearle serves as a bridge between companies that develop navigational software and the OR. "To improve patient care, it is essential to identify important clinical issues that can be addressed using this technology," says Dr. Pearle. "Our primary purpose is to work with engineers to translate current applications to surgical tools that can guide surgeons in the operating theatre and drive the industry in the direction we think is most important for patient care."

"These navigation systems also offer important opportunities to answer fundamental research questions," notes David L. Helfet, MD, Senior Director of the CAOS Center and Chief of Orthopedic Trauma. Over the next several years, the Center will focus on translational research that evaluates navigation strategies and modifies these tools for use in trauma, arthroplasty, and sports medicine procedures.

The Computer Assisted Orthopedic Surgery Center provides a simulated OR environment in which to investigate and further develop navigational software. Here, Dr. Andrew Pearle demonstrates the acquisition of reference points by navigated instruments to help plan knee replacement surgery.


INFRA-RED DETECTED
INFRA-RED DETECTED
INFRA-RED DETECTED

Left: Following surgery, patients wait in a bright and spacious recovery area adjacent to the new ambulatory operating room suite.

Below: Viewing high-tech monitors that provide sharp detail of the patient's knee anatomy, Dr. Frank Cordasco performs an arthroscopic meniscal repair in the "OR of the future."

Below, right: A nurse completes a pre-surgical interview with a patient in the new holding area.

Optimizing AMBULATORY surgery

Hospital for Special Surgery's ninth floor has been transformed into a new state-of-the-art surgical suite dedicated to outpatient procedures, along with spacious and comfortable pre-surgical, recovery, and family waiting areas. With nearly 18,000 surgeries performed annually at the Hospital, ambulatory procedures now account for half.

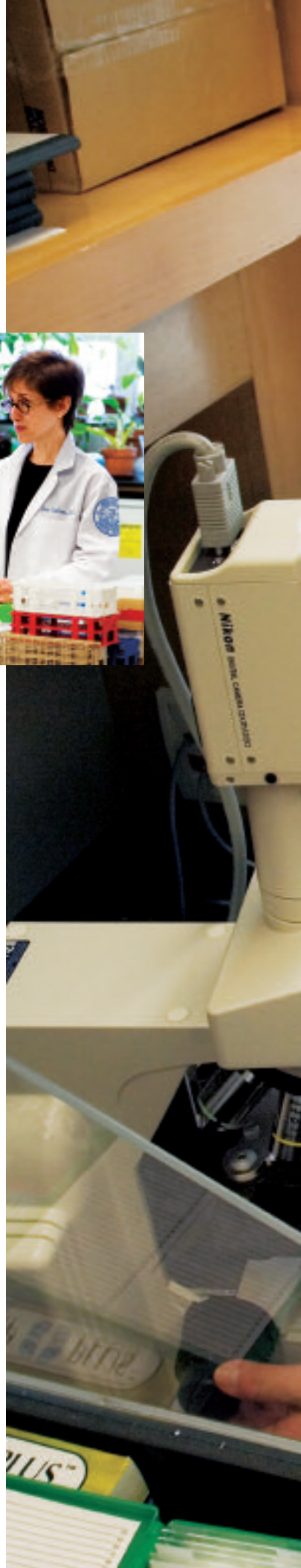
"In the last 10 years, our surgical volumes have increased by almost 60 percent," says Thomas P. Sculco, MD, Surgeon-in-Chief. "This unprecedented growth is being fueled by a growing group of people in their 60s and 70s and an increasingly active younger population at risk for sports injury."

"We view this as an operating room of the future," says Frank A. Cordasco, MD, who guided the development of the new OR suites and is the Surgical Director of the Ambulatory Surgery Center. Each operating room features three high-definition, flat panel television monitors that provide greater detail of surgical procedures and can be viewed by everyone in the room, at any given time. In addition, many of the instruments and electronic equipment previously stored on rolling towers now hang from booms, clearing floor space so that surgical staff can access the patients and instruments easily and efficiently.

"The new ORs accommodate the larger equipment that we need for more recently developed outpatient procedures, such as hip arthroscopy," notes Dr. Cordasco, "while also creating an environment that is more conducive to performing complex knee and shoulder ligament and tendon reconstructions.

"We have also integrated an information technology infrastructure that allows us to transmit live surgery not only to the amphitheatre on the Hospital's second floor, but also to conference rooms in Boston, Bangalore, or Beijing," adds Dr. Cordasco. "From the standpoint of education, we can provide training to surgeons anywhere in the world."

Predicting pregnancy outcomes in LUPUS



A pregnancy should signal a joyous time. But for women with lupus, pregnancy can bring complications, particularly in those who have the antiphospholipid syndrome. A research team, led by Jane E. Salmon, MD, the Collette Kean Research Chair and Co-Director, Mary Kirkland Center for Lupus Research, crosses both basic and clinical arenas to help address pregnancy loss in these patients through PROMISSE – a multimillion dollar, multicenter study funded by the National Institutes of Health that seeks to define biomarkers that predict a bad pregnancy outcome. "From PROMISSE, we have learned that pregnancy complications are less frequent than predicted – the result of more aggressive therapies," says Dr. Salmon. "Now, we are looking for circulating proteins that predict placental damage and fetal injury in patients who fail treatment. These biomarkers may identify new targets to prevent pregnancy complications."

Michael D. Lockshin, MD, Director of the Barbara Volcker Center for Women and Rheumatic Disease and Co-Director, Mary Kirkland Center for Lupus Research, was among the first to describe the association between pregnancy loss in lupus and antiphospholipids back in 1985. "The PROMISSE study is the type of research that will lead to a new textbook that will rewrite the rules about lupus pregnancy."

Left: Dr. Michael Lockshin with Brendon Feldgoise, one of the first babies delivered by a mother with lupus in the PROMISSE study.

Center: More than 350 patients have enrolled in the study, including Lee Urena (left), with daughter Gabriela, who is joined by Schiffon Phillips, Project Coordinator; Phuong Le, Clinical Research Coordinator; and Marta Guerra, Administrator, Translational Research Project.

Right: Dr. Jane Salmon (and above) with Dr. Guillermina Girardi, who studies antiphospholipid antibodies in experimental models.


HOSPITAL FOR
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Top: Linda Leff, RN, Coordinator of the Infusion Therapy Unit, talks with Kim Davis, who is undergoing infusion therapy with intravenous immune globulin four times a month as treatment for her connective tissue disease.

Above: As a basic scientist and a rheumatologist, Dr. Lionel Ivashkiv is fostering research that spans from the cellular level to clinical care.

Translating DISCOVERIES into treatments

Dr. Peggy Crow and her colleagues are interested in the interferon pathway and other inflammatory pathways that might reveal potential therapeutic targets in patients with lupus.

The basic science work of Lionel Ivashkiv, MD, and Peggy Crow, MD, is crossing the bridge from bench to bedside.

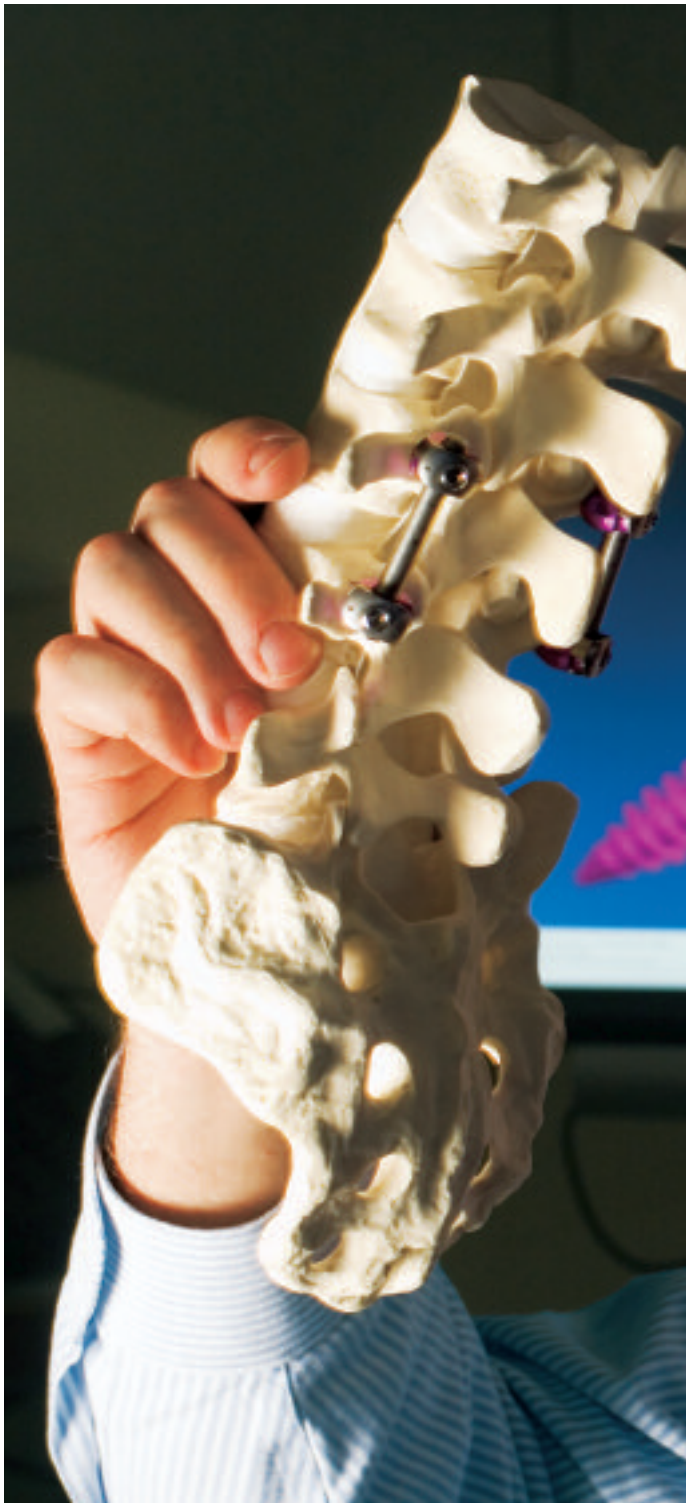
By pinpointing the mechanism through which intravenous therapy combats chronic inflammatory diseases, Dr. Ivashkiv and his colleagues have discovered that this time-consuming infusion therapy may be able to be replaced with an injection. "Intravenous immune globulin (IVIG) or antibody therapy works, in part, by blocking the function of interferon gamma, a major inflammatory factor," says Dr. Ivashkiv, Director of Basic Research and the David H. Koch Chair for Arthritis and Tissue Degeneration Research. "Only a small component of the IVIG solution, which is pooled from thousands of blood donors, is responsible for blocking this receptor, suggesting that the immune complexes within the preparation are causing the therapeutic effect." As a result, clinicians may be able to use small amounts of so-called immune complexes in the therapy.

Peggy Crow, MD, the Benjamin M. Rosen Chair in Immunology and Inflammation Research, directs the Autoimmunity and Inflammation Program. One project in her laboratory is focused on interferon-alpha as a mediator of disease in lupus. "A significant number of lupus patients have interferon pathway activation as a major component of their immunological response," says Dr. Crow. "Specific interferon-alpha responsive genes are turned on in the setting of active lupus. Determining the cause of interferon-alpha production and understanding its implications for disease are our challenges."

Says Dr. Ivashkiv, "Dr. Crow's basic science work carries the potential for a major breakthrough in the treatment of lupus – the first in 30 or 40 years." The therapies that target these interferons have just begun to be tested in early Phase 1 clinical trials.

Advanced solutions for SPINAL surgery

As a teacher of 44 second-graders, Nancy Dailey spends a lot of time on her feet. So when a sharp pain radiating down her leg suddenly came on last summer, she had reason for concern. Her rheumatologist Michael D. Lockshin, MD, Director of the Barbara Volcker Center for Women and Rheumatic Disease, recommended she see a spine specialist, and Mrs. Dailey came to see Andrew Sama, MD. Dr. Sama identified a cyst on her spine that was impinging a nerve at the fourth and fifth lumbar vertebrae. She managed the pain for several months with epidural injections, but by January it was excruciating and Dr. Sama recommended surgery.



"Mrs. Dailey had instability in one level of her spine and severe degeneration of the discs at the bottom two levels," explains Dr. Sama. "As a result, she kept forming cysts that would push on the nerves causing her great pain. We needed to take the pressure off the nerves and then stabilize the spine to allow the bones to heal."

The complex, six-hour surgery would require stabilization with specially designed instrumentation. The Hospital's team of engineers and surgeons had recently developed a comprehensive spinal fusion system that will eventually be able to address virtually any issue, from the skull to the sacrum. The new instrumentation would prove ideal for Mrs. Dailey's condition.

The array of elements required in the development of the instrumentation system was staggering – some 50 pieces, including multiple screws color-coded according to their diameter, a tap sized for every screw, various rod configurations with slightly different curvatures to match the particular location in the spine, as well as pedicle diameter measurement tools to ensure the precision needed when operating close to the spinal cord.

The need for the new instrumentation system was identified by Dr. Sama and Federico P. Girardi, MD, who

A key member of the spinal instrumentation development team, Joseph Lipman illustrates the application of specially designed screws and rods for the lumbar spine that allows orthopedic surgeons to stabilize each individual vertebrae. The screws are connected in each pedicle above and below the degenerative disc, while the rods go between the screws to provide a stable construct.

are participating in its development and are now using the lumbar component, which was the first phase to be completed. “The next phase is to expand the system in both directions, beginning with components for the sacrum and then moving up through the thoracic spine and into the neck and skull,” says Joseph Lipman, MS, Director of Device Development, Department of Applied Biomechanics in Orthopedic Surgery.

“This is strictly a posterior system,” continues Mr. Lipman. “While there are systems on the market that treat just the lumbar spine or cervical spine, none existed that could be used from top to bottom. We have already mapped out the entire system on paper, and now we just have to translate that paper into parts. The intent is that every component will fit together easily and simplify surgery.”

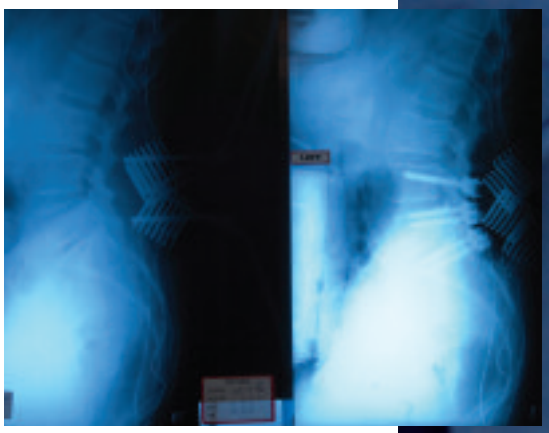
According to the development team, there were many subtle design issues to consider. For example, they had to make sure that the screws wouldn’t breach the pedicle wall that protects the spinal cord. It was extremely important that the implant instrument interface would hold the screws securely. The team also worked closely with the medical device company Ortho Development Corporation to make sure the components could be manufactured economically.

“We partnered with Ortho Development to develop an instrumentation system that is very user friendly and applicable to the full length of the spine to bridge those areas that are particularly difficult to address due to their location,” says Dr. Girardi. “Going from the neck into the thoracic spine, from the thoracic spine into the lumbar spine, and so on, poses surgical challenges.”

Dr. Girardi adds that the bone has to be reasonably healthy in order to maintain fixation of the screw. However, for patients who may have some bone issues,” he notes, “we are exploring ways to improve fixation.”

In Mrs. Dailey’s surgery, Dr. Sama used six screws and two rods that could be cut to size to fuse her lower spine. “Because it’s a modular system it can be customized to each patient,” says Dr. Sama. “And we wanted to develop a system that would give us greater control and flexibility in the operating room. I think we’ve done that very nicely.”

Dr. Marcelo Molina, Dr. Federico Girardi, and Dr. Andrew Sama operate on Nancy Dailey using the new spinal instrumentation system designed by Special Surgery and Ortho Development engineers and surgeons. The implant is made of titanium alloy and pure titanium – a material with malleable qualities making it easy to contour to a particular shape.



Radiology images of Mrs. Dailey's spine before her surgery (left) and post-operatively with the new lumbar instrumentation system in place that was used to fuse her lower spine.

2006 Annual Report

Opposite page:
Nancy Dailey is well on her way to recovery just three weeks following major spine surgery.

2006 Leadership Report

Each year, thousands of patients come to Hospital for Special Surgery confident that our physicians and health care professionals will restore their mobility and improve the quality of their lives. In 2006, we made great strides in several areas central to our mission to meet our patients' needs by providing the finest musculoskeletal care in the world. Major accomplishments included the opening of state-of-the-art facilities, new clinical initiatives, continued growth in our research endeavors, and the recruitment and appointment of outstanding leadership and personnel in clinical, scientific, and administrative roles.

Recognizing Excellence

In 2006, Hospital for Special Surgery earned national recognition on a number of fronts, reflecting what we consider our greatest accomplishment – the extraordinary care that we provide to our patients every day.

In 2006, the Hospital was ranked second in the nation in orthopedics and third in rheumatology by *U.S.News & World Report* in its "America's Best Hospitals" survey. It is the only New York metropolitan area hospital ranked in the top ten nationwide in orthopedics. For the 16th consecutive year, the Hospital has ranked above all other hospitals in the Northeast in orthopedics and rheumatology. With more than 5,000 hospitals evaluated nationwide, rankings are based on reputation, quality measures, nursing care, patient volumes, and mortality rates, as well as the availability of technology services.

In addition, in *New York* magazine's inaugural issue of "The Best Hospitals," Hospital for Special Surgery ranked first in knee surgery, back surgery, and hip replacement. In addition, the Hospital ranked among the top ten hospitals overall in the tri-state area. Thirty-five of the Hospital's physicians were acknowledged in the magazine's "Best Doctors" issue. Chosen by their peers, these physicians are among the top two percent of doctors in the New York area.

Hospital for Special Surgery's Department of Nursing, committed to patient-centered care that exceeds national nursing standards, earned Magnet redesignation by the American Nurses Credentialing Center (ANCC) in 2006. Accepted throughout health care as the gold standard for nursing, Magnet status recognizes health care institutions that exemplify excellence in nursing. Our high nurse recruitment and retention rates, job satisfaction, and nurse-to-patient ratios all contributed to this prestigious honor, making the Hospital the first in New York City and in New York State to be twice designated for nursing excellence by the ANCC. Hospital for Special Surgery was first named a Magnet hospital in 2002, the first hospital in Manhattan to earn this designation.

Promoting Patient-Centered Care

Hospital for Special Surgery continues to raise the bar in the development of people, programs, and processes to further advance an environment of quality, patient safety, and service excellence. In 2006, these efforts included:

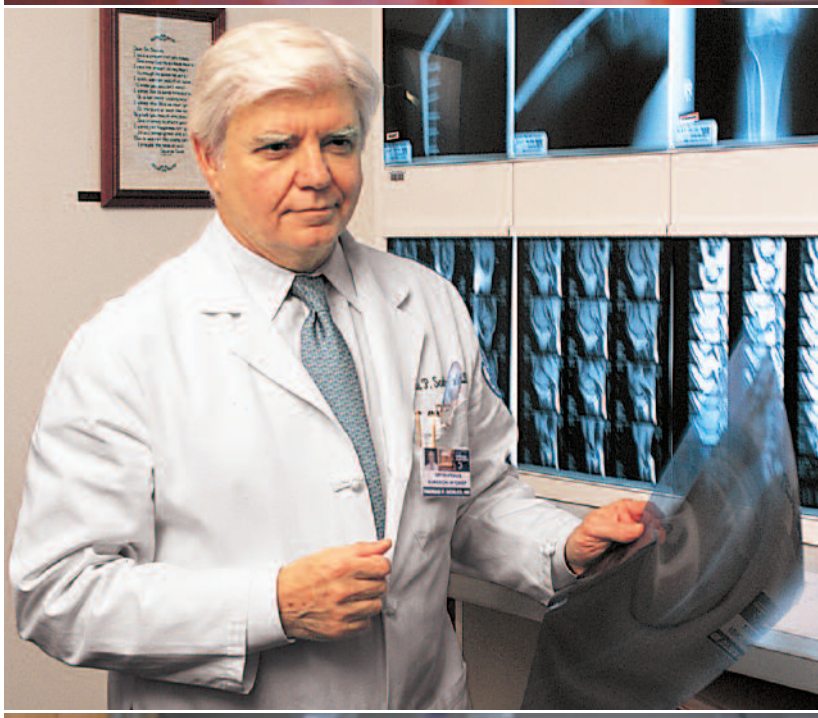
Ambulatory Care

The Hospital has redesigned its ambulatory care program for orthopedic clinic patients to further enhance the delivery of both surgical and nonsurgical services. Patient care will be overseen by an orthopedic surgeon recruited specifically for this program and provided by our outstanding team of attending orthopedic faculty, as well as residents and fellows. Their care will be coordinated with a team of medical physicians and health care professionals. At Hospital for Special Surgery, we are committed to providing one level of care to all patients who come to our Hospital, and this new clinic reorganization ensures that this will happen.

Hospitalist Program

Hospital for Special Surgery's inpatients are benefiting from an expanded hospitalist program, which provides physicians whose primary focus is the general medical care of hospitalized patients. Initiated two years ago, our hospitalist program has proven so successful that by July we will have five full-time hospitalists who closely monitor and care for any patient admitted to the Hospital, particularly during nights and weekends.

Leading the future of Hospital for Special Surgery are clockwise from top left: Dean R. O'Hare and Aldo Papone, Co-Chairs, Board of Trustees; Thomas P. Sculco, MD, Surgeon-in-Chief and Medical Director; Steven R. Goldring, MD, Chief Scientific Officer; Stephen A. Paget, MD, Physician-in-Chief; and Louis A. Shapiro, President and CEO.



Welcome to New Physicians

Teena Shetty, MD
Neurology

Friedrich Boettner, MD
Orthopedic Surgery

Alejandro Leali, MD
Orthopedic Surgery

Suchitra S. Acharya, MD
Pediatrics

Stephanie L. Perlman, MD, Pediatrics

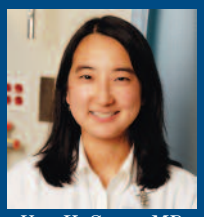
Li Foong Foo, MD
Radiology

Matthew Fred, MD
Rheumatology/
Medicine

Wesley Holloman, MD
Rheumatology/
Medicine

Mary J. Kollakuzhiyil, MD
Rheumatology/
Medicine

Sonal S. Parr, MD
Rheumatology/
Medicine



Yon K. Sung, MD
Rheumatology/
Medicine

Lisa C. Vasanth, MD
Rheumatology/
Medicine

Evette Weil, MD
Rheumatology/
Medicine

Hospital for Special Surgery continues to recruit outstanding physicians who enable us to remain a leader in our fields and serve the increasing number of patients who seek out our care for musculoskeletal conditions.

Center for Musculoskeletal Ultrasound

In May 2006, the Hospital opened the Center for Musculoskeletal Ultrasound. The Center uses state-of-the-art imaging techniques to diagnose and treat orthopedic and rheumatology conditions. It serves as an educational resource for medical professionals and as a research venue for further study and development of new approaches that will continue to shape the direction of ultrasound as it relates to musculoskeletal diagnosis and treatment.

PACS – Picture Archiving and Communication System

In 2006, the first group of Hospital physicians began using PACS with great results. This filmless system enables our physicians to view MRI, CT, ultrasound, and other radiology images instantaneously on computers in their own offices.

Leon Root, MD, Motion Analysis Laboratory

This uniquely designed laboratory analyzes movement and muscle patterns for clinical and research purposes. One of the largest of its kind in the country, the Root Motion Analysis Laboratory performs comprehensive evaluations to determine gait characteristics, functional ability, muscle strength, and energy efficiency in individuals of all ages.

Institute for Healthcare Improvement Initiative

Hospital for Special Surgery continues to maintain a very low incidence of infections. In 2006, the Hospital had an overall surgical site infection rate of 0.29 percent.

The Hospital continues to make patient safety its top priority. In accordance with our goal of zero tolerance for adverse events, the Hospital participated in the Institute for Healthcare Improvement's (IHI) *100,000 Lives Campaign* – a national program for reducing overall morbidity and mortality in American health care. Adopting IHI's recommendations for reducing surgical-related infections, the Hospital – already a leader in preventing such infections – was among the top 10 percent of health care institutions nationally that reliably administered the correct antibiotic at the proper time to prevent postoperative infection. In addition, the Hospital undertook several new

performance improvement processes to track and communicate patients' medication administration before, during, and after their stay.

Wellness Programs

To enable patients to continue to facilitate their recovery, maximize their mobility, and enhance well-being after therapy has been completed, the Department of Rehabilitation Services has incorporated wellness programs in their continuum of care. These programs, including group exercise classes and workshops, target patients with specific diagnoses, such as lower extremity and spine conditions. Additionally, programs offered through the Integrative Care Center have grown tremendously, with classes in tai chi, yoga, pilates, and osteo fitness. The Hospital's Osteoporosis Prevention Center has relocated to the Integrative Care Center, complementing the breadth of their wellness offerings.

Introducing New Facilities

Fall 2006 heralded the completion of the first phase of the Hospital's major building project, adding 85,000 square feet of new space and 100,000 square feet of re-engineered and redesigned space. A new Ambulatory Surgery Center was built on the ninth floor, with eight ambulatory surgical suites, comfortable pre-surgical and recovery areas, and a spacious family area for registration, information, and waiting. Two operating rooms for hand, foot, and ankle surgery remain open on the first floor. In addition, a new 8,000-square-foot, state-of-the-art Central Sterile Supply facility was constructed, including dedicated elevator service to the operating rooms with one elevator exclusively used for sterile linens and equipment, furthering the Hospital's rigorous infectious control efforts.

The eighth floor added 30 new inpatient beds in both semi-private and private rooms. The décor, lighting, and magnificent views of the East River provide a soothing environment in which patients can convalesce.

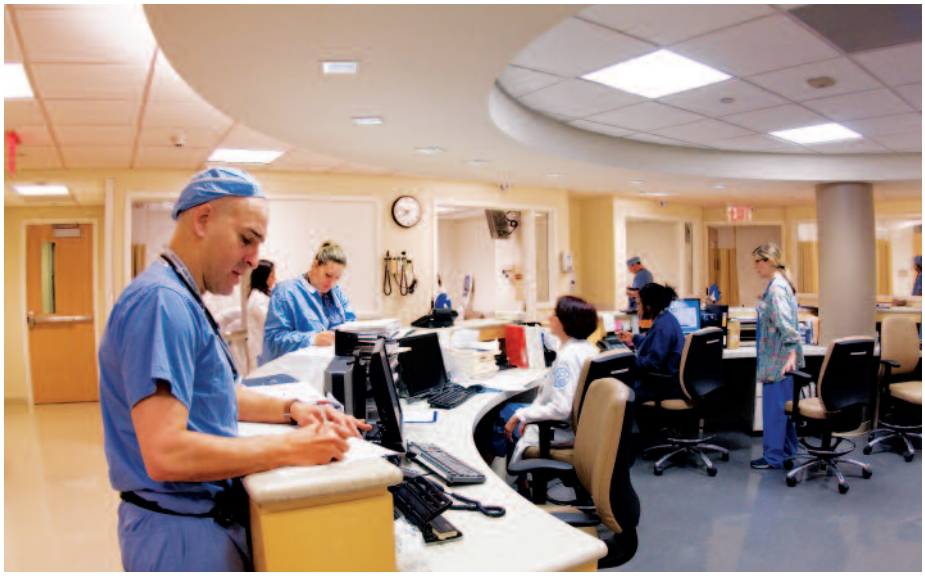
Plans call for an increase in the number of inpatient operating rooms from 15 to 21 on the fourth floor by 2010, as well as the addition of two magnetic resonance imaging machines in 2007, bringing the Hospital's number of MRIs to seven and making it the nation's largest academic MR imaging center dedicated to musculoskeletal medicine.

The Hospital has now embarked on the next phase of its major building program. Plans include the construction of a new children's pavilion in the existing Hospital, along with two new inpatient units. A new building will be constructed that will house two of the largest services at Special Surgery – the Arthroplasty Service and the Sports Medicine and Shoulder Service. This expansion will make possible the growth of other specialty services, in particular, our spine program.

The Arthroplasty Center will serve as the hub of Special Surgery's joint replacement expertise and contain physicians' offices, examination rooms, and on-site radiology services. The Sports Medicine and Shoulder Service will contain a state-of-the-art Sports Rehabilitation and Performance Center with areas for performance testing and analysis, using various terrains to replicate performance environments.

Advancing Research

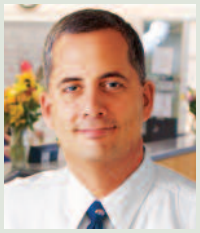
In 2006, the Hospital moved forward with an ambitious plan to better integrate its basic, translational, and clinical research efforts. The objective is to create a platform for insuring the translation of clinical and basic science to patient care. The program more closely aligns research and clinical priorities and activities and provides an optimal environment for education and training.



Above: Each of the new inpatient rooms on the Hospital's eighth floor afford restful views of the East River.

Left: The new Ambulatory Surgery Center on the ninth floor includes a spacious nursing station.

Louis A. Shapiro, President and Chief Executive Officer



In October, 2006 Louis A. Shapiro joined Hospital for Special Surgery as President and Chief Executive Officer. Mr. Shapiro will guide the exceptional growth and change the Hospital is undergoing in this new century.

Mr. Shapiro came to the Hospital from Geisinger Health System – a highly respected health care system serving 2.5 million people in northeastern and central Pennsylvania. While there, he served as Executive Vice President and Clinical Enterprise Chief Operating Officer, contributing to the System's significant clinical and academic growth and development.

A graduate of the University of Pittsburgh's College of Arts and Sciences, Mr. Shapiro earned a master's degree in Health Administration from the University of Pittsburgh's Graduate School of Public Health. He is a Fellow in the American College of Healthcare Executives.

Over the years, funding for Hospital research from the National Institutes of Health (NIH) has steadily increased. In 2006, a number of major NIH grants were awarded to our scientists, including:

Adele Boskey, PhD – a five-year, $2.8 million grant from the National Institute of Dental and Craniofacial Research (NIDCR) to continue to study the mechanism of bone and hard tissue mineralization, and three grants from the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMSD); a four-year, $1.5 million grant to study biological calcification in vitro; a five-year, $3.5 million core grant to establish a Musculoskeletal Repair and Regeneration Core Center for investigations in this field; and a four-year, $2.2 million grant to study the FT-IR microscopy of mineral structure in osteoporosis

Mary Goldring, PhD – a five-year, $1.7 million award from NIAMSD to study the role of DDR2 in OA-like pathogenesis in osteochondrodysplasias (Dr. Goldring recently joined the Hospital from Harvard Medical School, bringing this award with her.)

Lionel Ivashkiv, MD – a five-year, $2.1 million grant from the National Institute of Allergy and Infectious Diseases (NIAID) to study interferon regulation in systemic lupus

Theresa Lu, MD, PhD – a five-year, $1.9 million from NIAID to study lymphoid tissue microvessel growth

Eric Meffre, PhD – a five-year, $2.2 million grant from NIAID to study the loss of B cell tolerance in rheumatoid arthritis

Inez Rogatsky, PhD – a five-year, $1.6 million grant from NIAID to study the mechanisms of immunosuppressive actions of glucocorticoids

Jane Salmon, MD – a five-year, $1.9 million award from NIAMSD to study the mechanism of aPL antibody induced pregnancy loss

Of particular note, two of our orthopedic surgeons – **Jo A. Hannafin, MD, PhD**, and **Scott A. Rodeo, MD** – have reached a milestone in their biomedical careers with the awarding of their first R01 grants from the NIH in the area of anterior cruciate ligament repair. These awards recognize not only their record of scientific achievement, but also the importance of the research of the Hospital's clinician-scientists to the field of orthopedic surgery. Dr. Hannafin's three-year, $1.1 million award supports her work to explore the effect of mechanical stimuli on the structure and function of the anterior cruciate ligament in order to facilitate ACL repair, including tissue engineering approaches. The long-term objective of Dr. Rodeo's four-year, $1.4 million award is to investigate the cellular and molecular events that control healing at the tendon-to-bone attachment site and to understand the effect of mechanical load on inflammation and healing at this site.

In addition, a five-year, multimillion-dollar grant was received from the Agency for Healthcare Research and Quality to establish a Center for Education and Research on Therapeutics (CERT), with a focus on therapeutic medical devices. The study is a collaborative effort between the Arthroplasty Service at Hospital for Special Surgery and clinical researchers both at Special Surgery and Weill Cornell Medical College. The CERT grant supports research to evaluate the uses and success of prosthetic orthopedic devices. A comprehensive prospective Total Joint Replacement Registry is being developed to collect data to address

questions regarding outcomes, variations, and economic impacts of total joint surgeries. This is the first external major funding of this magnitude for clinical research at Hospital for Special Surgery and a landmark accomplishment.

Pursuing Academic Achievement

In August 2006, the Division of Education – which oversees academic training; professional education; research education and training; and patient and public education – hosted its first annual retreat to review and discuss strategic plans and develop education standards of excellence in communication, accountability, and professionalism.

In March 2006, the Hospital's Residency Selection Committee interviewed 55 of 435 applicants for its highly competitive and sought-after orthopedic surgery residency program. Once again, all eight positions were filled with outstanding candidates coming from the prestigious university medical schools of Columbia, Cornell, Harvard, Johns Hopkins, University of Pennsylvania, Vanderbilt, University of Wisconsin, and Yale. In June 2006, seven residents and 47 fellows graduated from the Hospital's rheumatology and orthopedic educational programs. An ACGME site visit of the adult reconstruction fellowship conducted in April resulted in approval to permanently increase the complement of fellows from four to six and continued accreditation for five years. Our annual Department of Health unannounced site visit for monitoring of resident work hours and supervision resulted, once again, in full compliance with State regulations.

The Division has established a relationship with the accrediting agency in Italy to help provide CME courses, and through our International Visitors Program hosted 30 Italian orthopedic surgeons for a two-day comprehensive conference on best practices in knee replacement. In addition, the Hospital has formed an affiliation with Clinica Alemana in Santiago, Chile for educational and clinical collaboration and exchange. The orthopedic service at the Clinica is one of the largest and most prestigious in South America.

The fourth edition of the *HSS Journal* – the only multidisciplinary musculoskeletal peer-reviewed journal in the world – was published and distributed to 15,000 medical professionals worldwide. The fifth edition of the *Journal* has been broadened to include articles by faculty from other institutions.

Patient, public, and professional education programs continued to flourish in 2006, reaching more than 4,000 participants. The Greenberg Academy for Successful Aging, a collaboration of Hospital for Special Surgery and NewYork-Presbyterian/Weill Cornell, held 30 programs reaching nearly 800 individuals.

Caring for the Best

The Hospital's physicians and athletic trainers manage the care of numerous major professional sports teams and organizations, including the New York Mets, New York Giants, New York Knicks, New York Liberty basketball team, the Association of Tennis Professionals, and the U.S. Rowing Team. Joining this impressive roster are the New York Red Bulls soccer team and the New Jersey Nets basketball team. With its new partnership, the Red Bulls has officially named Riley J. Williams III, MD, as its team physician and David S. Levine, MD, and Bryan T. Kelly, MD, as associate team physicians. David W. Altchek, MD, and Dr. Williams were named team physicians for the Nets.

Celebrating Our Successes

At the core of Hospital for Special Surgery is a committed staff dedicated to their work and who aspire to great achievements in musculoskeletal medicine. Among those recognized for their accomplishments in 2006 were:

David W. Altchek, MD and **Scott A. Rodeo, MD** – named Co-chiefs of the Hospital's Sports Medicine Service, succeeding Thomas L. Wickiewicz, MD, who served as Chief for more than a decade

Oheneba Boachie-Adjei, MD – honored by the Scoliosis Research Society with the Blount Award for dedication to the advancement of knowledge in the field of scoliosis and in recognition of unique talents in this area

Stephen W. Burke, MD – retired from orthopedic practice after two decades with the Hospital, having served as Chief of the Pediatric Orthopedic Service for seven years

John Cavanaugh, PT/ATC – served as Head Athletic Trainer for the USA National Swimming Team at the World Short Course Swimming Championships in Shanghai, China

Charles N. Cornell, MD – named Clinical Director of Orthopedic Surgery at the Hospital

Edward V. Craig, MD – named Director of the Hospital's Orthopedic Residency Program

Steven B. Haas, MD – named Chief of the Knee Service at the Hospital, succeeding **Russell E. Windsor, MD**, who led the service for 15 years

Steven R. Goldring, MD
Chief Scientific Officer

Steven R. Goldring, MD, an internationally recognized expert in orthopedic and rheumatology research and care, has been named Chief Scientific Officer at Hospital for Special Surgery. Dr. Goldring heads the Hospital's basic and clinical research faculty and will shape the overall direction of clinical and basic research at HSS.

Dr. Goldring joined the Hospital from Harvard Medical School, where he was Chief of Rheumatology at Beth Israel Deaconess Medical Center and New England Baptist Hospital, Boston. In addition, he served as Professor of Medicine at Harvard Medical School and was Director of Research at New England Baptist Bone and Joint Institute at Harvard Institutes of Medicine.

Dr. Goldring received a BA from Williams College in 1965, and earned his MD at Washington University School of Medicine in 1969. He served his residency in medicine at Peter Bent Brigham Hospital, Boston, and completed a clinical and research fellowship in the Arthritis Division at Massachusetts General Hospital, Boston, in 1976.

Janet J. James – received the 2006 Wholeness of Life Award for her outstanding contributions as a nursing technician in ambulatory rheumatology services

Lawrence J. Kagen, MD – retired after 36 years of service to the Hospital, having served as Medical Director of Occupational Health Services and Medical Director of the Laboratory of Clinical Immunology

Richard S. Laskin, MD – honored with a named Chair in Orthopedic Medical Education in recognition of his tremendous contributions to orthopedic education. Support for the *HSS Journal*, for which Dr. Laskin serves as Editor-in-Chief, will also be generated from this Chair.

Eileen McCullagh, RN, ONC, CCRC – elected President of the Orthopedic Nurses of New York

Douglas E. Padgett, MD – named Chief of the Hospital's Hip Service, succeeding Paul M. Pellicci, MD, who served as Chief for 15 years

Helene Pavlov, MD – recognized among the most influential people in radiology in 2006 by *RT Image* magazine

Niles Perlas, RN – honored with the Presidential Filipino Award for her service to the indigent people of the Philippines

Eduardo A. Salvati, MD – named recipient of the Lifetime Achievement Award for Orthopedic Surgery by the Arthritis Foundation. Dr. Salvati, who is Emeritus Director of the Hip and Knee Service, will be honored at the Hospital's 2007 annual gala with a second Lifetime Achievement Award. Additionally, a Chair in Hip Arthroplasty has been created to recognize the countless contributions Dr. Salvati has made to hip surgery and research.

Eduardo A. Salvati, MD, **Nigel Sharrock, MB ChB**, **Geoffrey Westrich, MD**, **Hollis Potter, MD**, **Alejandro Gonzalez Della Valle, MD** and **Thomas P. Sculco, MD** – received the prestigious Nicolas Andry Award of the Association of Bone and Joint Surgeons for their study entitled "Three Decades of Clinical, Basic, and Applied Research on Thromboembolic Disease after Total Hip Arthroplasty"

Peter A. Torzilli, PhD – awarded the 2006 Herbert R. Lissner Medal from the American Society of Mechanical Engineers

Marjolein van der Meulen, PhD – featured as one of the world's leading women in engineering in *Changing Our World: True Stories of Women Engineers*, released by the Extraordinary Women Engineers Project

Scott W. Wolfe, MD – named Director of Faculty Development for the Hospital's Department of Orthopedic Surgery

Aviva L. Wolff, OTR/LCHT – elected an affiliate director of the American Association for Hand Surgery

Department of Rehabilitation Services – celebrated the publication of its textbook entitled *Postsurgical Rehabilitation Guidelines for the Orthopedic Clinician* – the only one of its kind, and featuring 25 years of collective knowledge on the spectrum of postsurgical rehabilitation as it relates to musculoskeletal disease

Supporting Special Surgery

Hospital for Special Surgery is grateful for its many close friends and long-time supporters who provide the resources that enable us to sustain and advance outstanding patient care,

education, research, and community service programs. In 2006, philanthropic giving surpassed $34 million. As of April 3, 2007, the Hospital's capital campaign has raised more than $47.5 million.

In June 2006, 925 friends of the Hospital gathered at Pier Sixty, Chelsea Piers for the 23rd annual tribute dinner. The event honored Russell F. Warren, MD, Surgeon-in-Chief Emeritus, and Roland Betts, Founder and Chairman of Chelsea Piers Management, raising $2.1 million – the highest level of support in the event's history. New York City Mayor Michael R. Bloomberg made a special appearance to present the 2006 Tribute Award to Mr. Betts in recognition of his professional and personal contributions to New York City. Dr. Warren received the 2006 Lifetime Achievement Award in tribute to his leadership and exceptional 29-year commitment to Special Surgery. The dinner was co-chaired by Tom A. Bernstein, President, Chelsea Piers Management; Jeff Bewkes, President and COO of Time Warner; Steve Schwarzman, head of The Blackstone Group, and William Salomon, trustee. Mrs. Emil Mosbacher, Jr., trustee, served as Dinner Committee Chair.

On November 10, 2006, the Hospital held its annual gala dinner, "A Night at the Opera," to benefit medical education. More than 300 guests enjoyed the New York City Opera's production of *The Elixir of Love*, while helping to raise $278,000. Cynthia P. Sculco served as Chairperson of the Benefit Committee.

The Hospital's Junior Committee completed its first year, raising more than $35,000, including $25,000 brought in through the Committee's three benefits – Jazz Age, a Fresh Air Home Reunion, and its second annual comedy event *Funny Bones*. The funds support Special Surgery's Pediatric Outreach Program.

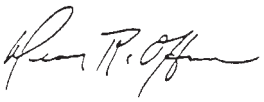
Moving Forward Together

Hospital for Special Surgery is fortunate to have the best doctors in the world, a family of employees who are passionate about what they do, a Board of Trustees committed to furthering our mission, and countless volunteers and friends who support our efforts to improve the lives of our patients. A newly established Board of Advisors joins the International Council as ambassadors for the Hospital.

Last year, the Hospital's Board of Trustees welcomed Charles P. Coleman III, and Monica Keany. Mr. Coleman is the founder of Tiger Global Management, LLC. Previously, he was a partner at Tiger Management, LLC, in the firm's technology group. Ms. Keany is a managing director in the Fixed Income Division at Morgan Stanley. Before attending Harvard University for her MBA, she worked as Special Assistant to the First Deputy Mayor of New York.

We would also like to take this opportunity to extend our gratitude to John R. Reynolds, who stepped down as President and CEO in the fall. Mr. Reynold's commitment to the Hospital over the last two decades has been extraordinary. During his tenure, the fiscal health of the Hospital was strengthened and the scope of our services for musculoskeletal disease greatly enhanced.

Much has been accomplished in the last year. Going forward, our opportunities as a world leader in musculoskeletal care are virtually limitless. Our highest priority has been and always will be to care for our patients and provide them with the mobility to enjoy a better quality of life. Working together, we will continue to make a difference for each and every patient who comes to us for musculoskeletal care.

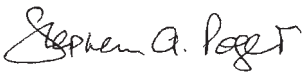


Dean R. O'Hare
Co-Chair

Aldo Papone
Co-Chair

Louis A. Shapiro
President and CEO

Thomas P. Sculco, MD
Surgeon-in-Chief and
Medical Director



Stephen A. Paget, MD
Physician-in-Chief

Steven R. Goldring, MD
Chief Scientific Officer

Caring for Children in the 21st Century

Since its founding in 1863, Hospital for Special Surgery has been dedicated to the care of infants, children, and adolescents with disabilities. Over the years, the Hospital's expertise in pediatric orthopedics and pediatric rheumatology has grown steadily, and our physicians and health professionals are recognized worldwide for their contributions to the diagnosis and treatment of such complex conditions as cerebral palsy, limb length discrepancies, club foot, spina bifida, skeletal dysplasia, juvenile arthritis, and pediatric lupus.

As the Hospital's reputation has grown, so has the number of parents and caregivers who bring their children to us for care. Today, with nearly 13,000 pediatric patient visits a year, the time has come to create a dedicated Children's Pavilion that will bring together all of our pediatric programs in a beautiful and child-friendly environment.

"Our goal is to meld the technological advances of a state-of-the-art specialty hospital with all the personal and caring attributes of a children's hospital," says Roger F. Widmann, MD, Chief of Pediatrics, who is spearheading its development. "This new facility will bring together all the related pediatric disciplines on one floor to facilitate interaction among the staff and provide patients and families with coordinated family-centered care."

An anonymous donor has contributed a lead gift of $15 million toward the development of the pavilion, which is scheduled for completion in 2009. The Children's Pavilion will span the fifth floor and be supported by an increased depth and range of pediatric staffing and services and an endowment to perpetuate the pavilion and its quality care, important to so many families. The 34,000-square-foot facility will house an expanded program for outpatients, a state-of-the-art rehabilitation complex for children with mobility challenges and developmental delays, and a spacious inpatient unit with single-bedded rooms for privacy, enabling parents to stay overnight comfortably with their children. As soon as children enter the Pavilion – with its cheerful playroom, and colorful and intriguing sights – they will know they are in a wing just for them.

Dr. Roger Widmann (left) and Dr. David Scher, along with their colleagues Walther H.O. Bohne, MD; Daniel W. Green, MD; Cathleen L. Raggio, MD; and Leon Root, MD, have personally supported the building of a new Children's Pavilion at Hospital for Special Surgery.

A physician who has dedicated his life's work to the musculoskeletal care of children, David M. Scher, MD, is playing a key role in the development of the new pavilion. Says Dr. Scher, "We treat the wide spectrum of orthopedic conditions in children of all ages and from all socioeconomic strata. The image and feeling that we want to portray is that when our young patients come here, they know it's a special place specifically designed for them."

Ruth and Gilbert Scharf and Matt and Mariko LeBaron know well the level of expertise that Hospital for Special Surgery's pediatric service provides.

The Scharf's son Ben suffered a fracture of his femur at the growth plate when he was 8 years old. At age 11, he came to see Dr. Widmann, beginning a nearly year-long treatment process to address complications resulting from the earlier fracture, including complex surgeries and a leg lengthening procedure to correct a 20-degree growth deformity. Ben will still need another procedure to complete his treatment, but in the meantime, he has returned to a full level of activity, playing tennis, basketball, and even snowboarding.

"I'm a big believer in giving back," says Mr. Scharf, who with his wife, is generously supporting the Children's Pavilion. "Everyone worked as a well-coordinated team. Ben received superlative care, and we wanted to show our gratitude."

The LeBarons knew that their daughter Emma would be born with bilateral club feet. They met with Dr. Widmann before her birth, and Emma had her first appointment with him when she was two days old. Over the next three years, she underwent a series of casting, a surgical procedure, and bracing to keep her feet positioned properly. Now, nearly four years old, she has completed treatment and is participating in all the usual activities of children.

"Emma got absolutely first class medical care at Hospital for Special Surgery, and we are thankful for that," says Mr. LeBaron. "We wanted to do what we could to help others have just as good an experience or better in the new Children's Pavilion."

Hospital trustee Susan Rose, a longtime friend and patient of Special Surgery, is one of the most ardent supporters of the Children's Pavilion. "Whenever I see a child with a disability I think about what it does to a mom and a dad, how it alters a sibling relationship, and most of all, the struggle of that child trying to conquer it," says Mrs. Rose. "I am so happy that we are expanding our facilities because we've got the top doctors who can help the children most in need stand straight and walk well. I have utmost respect for every one of the doctors I've met – to me they are just giants."

Emma LeBaron and Ben Scharf can enjoy their childhood thanks to the care they received at Hospital for Special Surgery.

Finance Report

The demand for Hospital for Special Surgery's unique and specialized inpatient and outpatient services has grown at a rapid pace over the past few years and it is anticipated that this trend will continue. This is largely due to the quality of patient care provided by the Hospital to patients with musculoskeletal disorders and the increased awareness thereof. Furthermore, the aging of the population in general, as well as the growing population of people over 50 years of age who desire to lead a pain-free and active lifestyle, are favorable demographic trends for the growth of orthopedics and rheumatology. Patients come to the Hospital from all over the New York metropolitan area, as well as nationally and internationally.

In order to continue to accommodate the demand for the Hospital's services while also maintaining and enhancing the quality of patient care, we embarked on a major facility expansion and renovation project during 2005. The project incorporates additional operating rooms, inpatient beds, doctor offices, expanded space for ancillary and support functions, as well as a children's pavilion to serve the unique needs of our pediatric patient population. The first phase of this project was completed at the end of 2006 and included 60,000 additional square feet. The second phase of construction immediately followed and will continue through 2010. Included in this phase is more than 150,000 square feet of new space and renovation of existing space. The total cost of the project will be in excess of $230 million and will be financed by outside borrowings and a capital fundraising campaign.

The Hospital's Research Division is internationally recognized as a leader in the study of the diagnosis and treatment of musculoskeletal disorders. Our commitment to both basic and clinical research is a component of the overall Hospital mission and is critical to Special Surgery maintaining and enhancing its status as a premier institution in orthopedics and rheumatology. The close relationship between our clinical and basic researchers enables a rapid application of scientific discovery to the patient care setting. During 2006, $29.7 million was dedicated to a wide variety of research initiatives and programs. The ongoing recruitment and retention of gifted scientists and clinicians will enable the Hospital to continue to expand the scope of its research activities and maintain its leadership position in its fields. In addition to research, Special Surgery has continued to make significant investments in other programs critical to its mission, including information technology, patient care enhancements, and medical education.

Our consistently strong financial results and successful fundraising campaigns have provided the Hospital with the resources to make significant investments in personnel and capital infrastructure in an environment that poses numerous financial challenges. These challenges include complex and costly regulatory requirements, labor shortages in nursing and other critical staff categories, and expense inflation in excess of revenue inflation.

Hospital for Special Surgery is committed to investing the resources necessary to advance its ability to provide the highest quality musculoskeletal care, to train top orthopedic surgeons, rheumatologists, physiatrists, and other related specialists, and to conduct pacesetting research. In addition, we continue to make extraordinary progress in the development and implementation of technology that will enhance our ability to deliver care in a safe and efficient manner, while at the same time upgrading the Hospital's infrastructure to support each aspect of our mission. As a fiscally sound organization, the Hospital will continue to manage and grow its financial resources in order to meet the increasing need for musculoskeletal services and provide care for all patients who seek our expertise.

Stacey L. Malakoff
Executive Vice President and Chief Financial Officer

Financial Information[1][2]

Hospital for Special Surgery and Affiliated Companies

Statement of Income[3]

(In Thousands)	*Year Ended,* 2006	2005[4]
Hospital for Special Surgery		
Total Revenue[5]	$424,369	$403,294
Total Expenses[6]	420,081	392,707
Operating Income from Hospital for Special Surgery	$ 4,288	$ 10,587
Affiliated Companies		
Total Revenue[6]	$ 44,197	$ 39,930
Total Expenses[5]	44,715	40,017
Operating (Loss)/Income from Affiliated Companies	$ (518)	$ (87)
Operating Income	$ 3,770	$ 10,500

Statement of Financial Position

(In Thousands)	*December 31,* 2006	2005
Assets		
Current Assets (Excluding Investments)	$ 96,262	$103,672
Investments[7]		
Current	152,238	121,585
Long Term	56,589	51,851
Assets Limited as to Use	36,724	42,890
Property, Plant and Equipment – Net	302,930	262,410
Other Non-Current Assets	40,962	33,930
Total Assets	$685,705	$616,338
Liabilities and Net Assets		
Current Liabilities	$129,777	$117,673
Long Term Debt	191,715	167,260
Other Non-Current Liabilities	13,936	14,555
Total Liabilities	335,428	299,488
Net Assets	350,277	316,850
Total Liabilities and Net Assets	$685,705	$616,338

[1] *Includes activities relating to Hospital for Special Surgery and its affiliates (Hospital for Special Surgery Fund, Inc., HSS Properties Corporation, HSS Horizons, Inc., HSS Ventures, Inc., and Medical Indemnity Assurance Company, Ltd).*

[2] *Complete audited Financial Statements of both Hospital for Special Surgery and affiliates are available upon request from the HSS Development Department at 212.606.1196.*

[3] *Excludes $30.6 and $19.4 million of restricted philanthropic contributions in 2006 and 2005, respectively.*

[4] *For purpose of comparison, certain reclassifications have been made to the 2005 column to conform with the 2006 presentation. Such reclassifications had no effect on changes in net assets.*

[5] *Includes $1.0 million and $0.9 million of transactions between affiliates that are eliminated in consolidation in 2006 and 2005, respectively.*

[6] *Includes $29.3 million and $26.4 million of transactions between affiliates that are eliminated in consolidation in 2006 and 2005, respectively.*

[7] *Hospital for Special Surgery is the beneficiary in perpetuity of income from an outside trust. The fair value of investments in the trust are not included above and were $39.5 million and $36.3 million at December 31, 2006 and 2005, respectively.*

Philanthropic Highlights

In 2006, Hospital for Special Surgery experienced a banner year in fundraising, with contributions totaling $34.1 million, including $27 million for *Building on Success*: *The Campaign for the Future of HSS*. This is the greatest amount ever raised by Special Surgery in a single year.

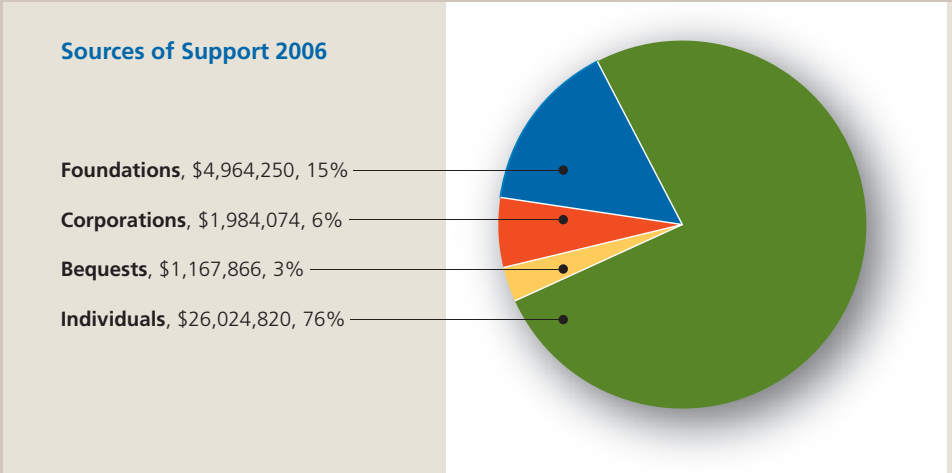
The Hospital continues to draw extraordinary support from countless individual, foundation, and corporate donors. Special Surgery is also attracting an increasing number of ambassadors who assist the hospital in community outreach and achieving philanthropic goals. The Junior Committee, chaired by Matt Paget, Christian Salvati, and Sarah Jane Sculco in 2006, exemplifies this new level of commitment. We are deeply grateful to all for their generosity and personal dedication, which helps to ensure our ability to provide the highest level of orthopedic and rheumatological care.

Fundraising in 2006

In 2006, Hospital for Special Surgery had a number of exciting fundraising accomplishments. These include:

- An anonymous pledge of $15 million to successfully launch the development of the Children's Pavilion, a "children's hospital" within the main hospital
- A record-breaking $2.1 million raised through the annual gala, expanding the breadth of unrestricted support for Special Surgery
- Attainment of the $2 million goal for the Russell Warren Chair in Orthopedic Research
- More than $1.2 million received through bequests and the establishment of six new charitable gift annuities as increasing numbers of friends and grateful patients are providing for the hospital in their estate plans.

Indeed, gifts from individual donors and their estates was the major source of support, accounting for 76 percent of total philanthropic giving. Foundations provided 15 percent of dollars raised, while corporations and bequests accounted for 6 percent and 3 percent, respectively.



Building on Success: The Campaign for the Future of HSS

Building on Success is dedicated to raising support for new clinical facilities and an expanded program of clinical research. Current and future patients are the beneficiaries of this undertaking. This represents both the largest capital renovation in the history of Special Surgery, as well as the most comprehensive initiative aimed at strengthening disease-based research.

To date, *Building on Success* has raised nearly $48 million, bolstered by unprecedented support from Board members and HSS medical staff during this quiet, "nucleus" phase. The Campaign continues to gain momentum under the leadership of Campaign Co-Chairs Mrs. Douglas A. Warner III and Kendrick R. Wilson III. The medical staff campaign is being chaired by Surgeon-in-Chief Thomas P. Sculco, MD, and Leon Root, MD. In addition, Trustee Chair Emeritus Richard L. Menschel is serving as Honorary Chair, having led the Campaign for Research to its successful $115 million completion.

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(April 1, 2007)

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A Lifetime of Philanthropy Endures

George D. Cornell

Revolutionary innovations in medical care and research like those highlighted in this issue of *Horizon* depend largely on philanthropic support. Planning a charitable gift to Hospital for Special Surgery is a simple, meaningful way to leave a lasting legacy while making a significant impact on quality of life. Following is the story of one donor whose extraordinary bequest plays an important role in the pacesetting advances in bone and joint care currently underway at Special Surgery.

Distinguished philanthropist and a descendant of the founder of New York's Cornell University, George D. Cornell remembered friends, family, and over 30 prestigious institutions in his will. In 2006, Special Surgery received the final disbursement from the Cornell Estate for a total of $2.8 million, all of which will benefit critical advancements in patient care, research, and education.

Unassuming Generosity

Mr. Cornell's affiliation with Special Surgery began with his wife, Harriet, an HSS patient who lived with polio until her passing in 1999. The couple enjoyed a lifetime of philanthropy, committing tens of millions of dollars to numerous organizations and touching many lives along the way. In one news article highlighting Mr. Cornell's philanthropy, his attorney, James McGarry, said, "Mr. Cornell gave solely for charitable purposes, and never sought credit or recognition."

Described by friends and family as an unassuming and quietly generous man, Mr. Cornell had a remarkable love for animals, particularly his two Samoyeds who he also named in his will. "George was a gentle man," remarked neighbor and longtime friend JoAnn Peart. "He treated everyone the same, no matter who you were."

Born in 1910 in Brooklyn Heights, Mr. Cornell was raised in Central Valley, New York, by Esther Haviland and Edward Cornell. His mother was an heiress to the Haviland china fortune, and his father was a prominent New York lawyer with the IBM corporation. In 1935, Mr. Cornell graduated from Rollins College, and pursued a brief career in finance. Years later, he returned to Rollins as a trustee, and together with his wife, was the institution's greatest benefactor.

Honoring a Quaker Heritage

"Both sides of my family have been Quakers for many generations," Mr. Cornell once said. "Part of the tradition and spirit of the Quakers is to give to charity…" In 2003, George Cornell passed away in his home in Delray Beach, Florida. His extraordinary bequest to Special Surgery not only memorializes Mr. Cornell's life and love for philanthropy, it will provide critical funding for perfecting new techniques for the delivery of care, to advance scientific discovery, and to help educate the next generation of medical professionals.

Individuals who have named Hospital for Special Surgery in their estate plans are recognized as members of The Wilson Society. The Society honors the legacy of two physicians – Philip D. Wilson, Sr., MD, and his son, Philip D. Wilson, Jr., MD, who have helped shape Special Surgery for more than half of its existence. If you would like more information or have included HSS in your will, please let us know by contacting Molly Murray, Director of Major Gifts, at 212-606-1196, so that we may recognize your generosity.

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Hospital for Special Surgery is an affiliate of NewYork-Presbyterian Healthcare System and Weill Medical College of Cornell University.

As dusk settles over New York City, Hospital for Special Surgery stands out along the East River promenade, reflecting the Hospital's exciting growth and the addition of new patient facilities that will accommodate the ever increasing need for our expertise.

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