

Discovery to Recovery

CLINICAL AND RESEARCH HIGHLIGHTS AT HSS | SPRING 2011

HOSPITAL
FOR
SPECIAL
SURGERY



Research Excellence Attracts NIH Funding

Three new grants from the National Institutes of Health (NIH) support teams of Special Surgery surgeons and biomechanical engineers who are working to improve patient outcomes in joint and tissue replacement. At HSS, surgeons and engineers collaborate in the lab, where surgeons bring what they learn from their work with patients to the attention of biomechanical engineers.

Biomechanics at HSS

Biomechanical engineers see the musculoskeletal system as a machine designed to provide the body with movement and protect vital organs like the brain, heart, and lungs. HSS biomechanical engineers partner with clinicians to ensure that patients receive the implants they need to treat injuries and disease that have structurally altered their knees, elbows, and other joints. Faculty in the Department of Biomechanics at HSS collaborate with faculty in the Sibley School of Mechanical and Aerospace Engineering at Cornell University. The Cornell-HSS program has existed since 1978, creating strong ties between the institutions and fostering educational and research programs between engineering faculty and students in Ithaca, New York, and clinical and research staff at HSS.

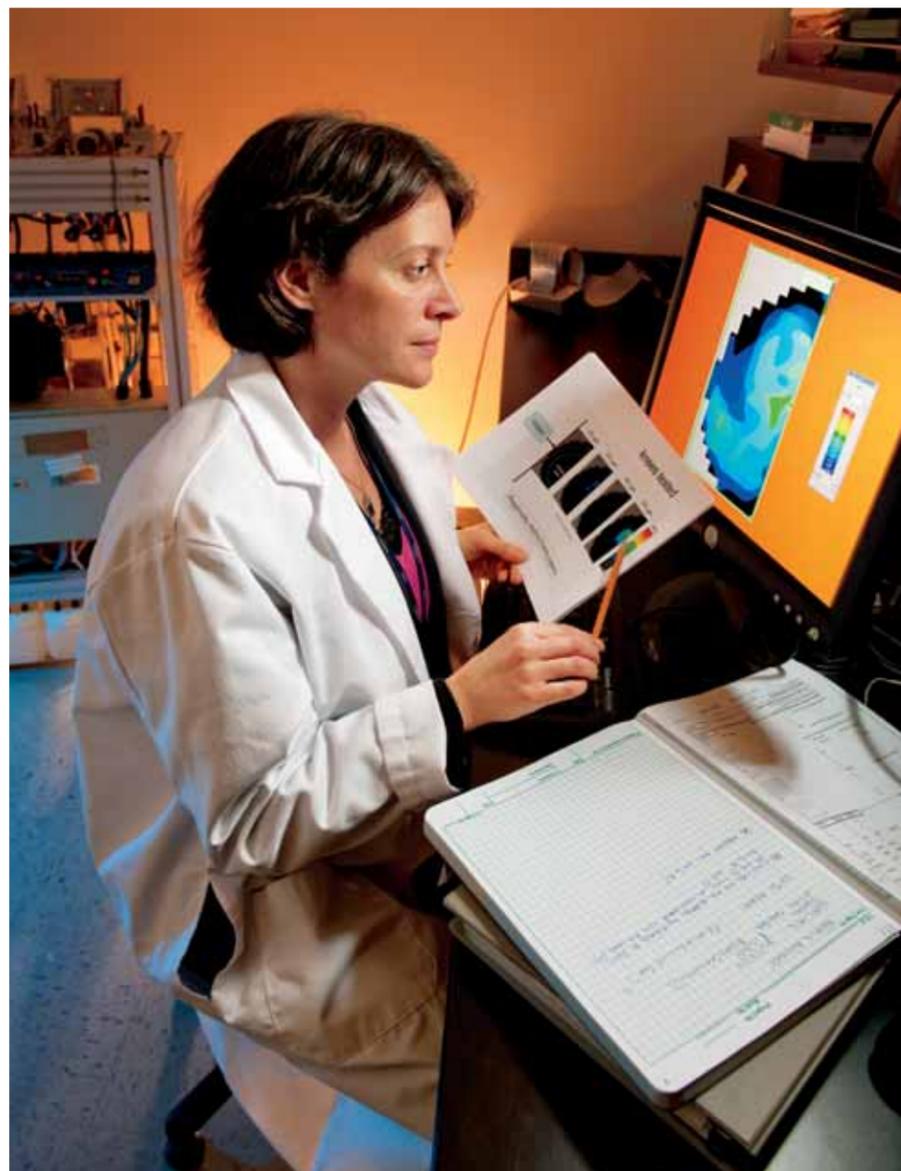
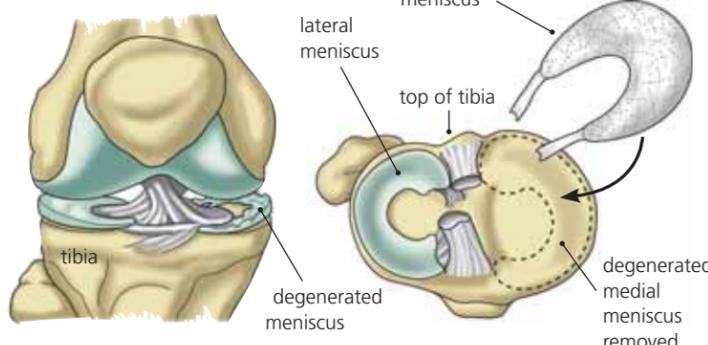
Restoring Knee Function with Cartilage Implants

Biomechanical engineer Suzanne Maher, PhD, assistant scientist in the Tissue Engineering, Regeneration and Repair Program and a member of the

Biomechanics Department at HSS, wants to identify the properties of an ideal meniscus replacement. The meniscus is a layer of cartilage that distributes forces across the knee joint. When the meniscus is injured, more force is borne by the remaining knee cartilage and the mechanics of the knee change. Eventually, knee osteoarthritis may develop.

HSS sports medicine surgeons, including Dr. Maher's co-investigator Surgeon-in-Chief Emeritus Russell Warren, MD, treat many patients who tear their meniscus through sports. Over 900,000 meniscus surgeries are performed each year in the United States, more than 3,500 at HSS alone. Currently, surgeons have three ways to treat meniscus tears: in a clean tear, the ends are sutured together; if the tear is not as clean, part of the meniscus is removed; and if the meniscus is damaged badly, it can be removed entirely and replaced with an allograft of healthy meniscus cartilage.

In previous research, Drs. Maher and Warren and their team found that none of these methods fully restores the pre-injury mechanics of the knee. Even with surgery, increased pressure on knee cartilage persists, suggesting that patients suffering a meniscus injury may develop osteoarthritis at an early



Above: Suzanne Maher, PhD, compares models for a novel meniscus implant that she is developing and testing. An ideal implant would closely resemble the native meniscus, providing adequate cushioning for the knee.

Left: Dr. Maher and colleagues are studying whether a synthetic material, a fiber-reinforced hydrogel, can be used as a meniscus replacement that could delay osteoarthritis onset in patients with meniscus injury.

age, possibly requiring a knee replacement while still young.

Pioneering a Meniscus Implant

To improve outcomes for patients with meniscus injuries, Dr. Maher is developing a new solution: a synthetic meniscus implant to restore the knee's pre-injury mechanics and prevent early-onset osteoarthritis. As an initial step, Dr. Maher developed an experimental model to test how well the implants reproduce healthy knee mechanics. She developed the model by converting a knee simulator, a large machine that simulates knee movements during activities like climbing stairs that is usually used to test total knee replacements, into a

machine in which she loads knees that have been inserted with her meniscus replacements.

The NIH is now funding Dr. Maher to validate her experimental model while simultaneously developing computational and statistical models that can be used by any scientist attempting to develop a meniscus implant to test the implant's effectiveness. Dr. Maher and her collaborators continue to develop their novel implant, which they test using their models.

"We are trying to make sure that the meniscal implant is doing mechanically what the surgeon wants it to do, which is to mimic the intact

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Improving Quality of Life through Research

Each year, hundreds of thousands of people choose Hospital for Special Surgery for their orthopedic and rheumatologic care, often traveling long distances. Our patients choose HSS because they know we are the best at what we do: getting them back to their full and active lives.

The data tell us that we are succeeding. When patients are asked to rate the outcomes of their hip and knee replacements two years following surgery, most say they have made dramatic improvements in their ability to move without pain. These excellent outcomes are reflected in the fact that HSS patients consistently recommend us to their friends and family; in our #1 ranking for orthopedics by *U.S. News & World Report's* 2010 "America's Best Hospitals" issue; in our ability to earn NIH funding; and in our outstanding reputation throughout the world.

While we are proud of our accomplishments and appreciate our patients' loyalty, the HSS culture is one of innovation. We advance medicine through research, and our high patient and procedural volumes allow HSS scientists to conduct the highest quality outcomes research in the fields of orthopedics and rheumatology. That would not be possible anywhere else. Our scientists have established more than 30 clinical registries to track outcomes and study disease mechanisms in common and complex musculoskeletal conditions and treatments. These registries have led to new research discoveries and important improvements in patient care and outcomes.

Last year, the National Institutes of Health recognized the vast research capabilities of HSS by awarding our scientists eight new grants, bringing Special Surgery's NIH portfolio to 61 grants totaling more than \$18 million. HSS scientists have a success rate of more than 32% when they apply for NIH grants, compared to the overall NIH success rate of around 20%.

While the three grants highlighted in the cover story support collaborative research between biomechanical engineers and surgeons, the NIH funds

a wide variety of projects at HSS, ranging from studying the molecular biology of the immune system to building a better elbow replacement. By funding this research, NIH is partnering with Special Surgery to advance the science of mobility.

Our scientists rely heavily on extramural funding sources to support their research. While HSS scientists have been highly successful in obtaining NIH funding this year, the Hospital is committed to supporting its scientists even in difficult financial times, and in recruiting and maintaining the highest level of scientific and clinical talent. In this issue of *Discovery to Recovery*, you will read about the endowed chairs program at HSS, an avenue through which the Hospital supports its best talent through philanthropy. Endowments, combined with the HSS tenure program, illustrate the Hospital's commitment to supporting medical research and innovation.

You will also read about research aimed at helping patients return to their active lives after surgery, whether that means playing pro football or playing with a grandchild; and about how HSS rheumatologists and surgeons collaboratively care for people with osteoporosis while advancing the medicine of that disease. While HSS scientists conduct research spanning all aspects of musculoskeletal science, they always remain committed to improving the quality of life of those who turn to us for help.

Sincerely,



Louis A. Shapiro
President and CEO



Thomas P. Sculco, MD
Surgeon-in-Chief



Steven R. Goldring, MD
Chief Scientific Officer

In the News

HSS Senior Scientist Receives \$2.5 Million from NIH to Study Osteoarthritis

Mary Goldring, PhD, director of the Laboratory for Cartilage Biology in the Tissue Engineering Repair & Regeneration Program at HSS, was awarded a new three-year \$2.5 million Director's grant from the National Institutes of Health. She will spearhead a multidisciplinary research effort towards a better understanding of the causes and progression of osteoarthritis, which will pave the way for scientists to develop new treatments for the disease.

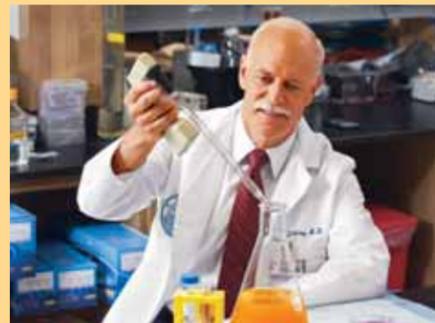


Mary Goldring, PhD

Osteoarthritis is the most common underlying medical condition for the nearly 250,000 patient visits each year at HSS. Scientists are still learning about the root causes of this disease, which occurs when joint cartilage wears thin, and which can cause debilitating pain. Currently, total joint replacement is the only known cure for end-stage osteoarthritis. Through this grant, Dr. Goldring and collaborators will advance the science of the disease from several fronts.

Dr. Goldring, Ira W. DeCamp Fellow in Musculoskeletal Genetics, will lead a coordinated effort with scientists at SUNY at Stony Brook, San Diego State University, and Harvard School of Dental Medicine to uncover novel common causes and critical molecular networks involved in both post-traumatic and genetic osteoarthritis. The research will provide a comprehensive and integrated picture of regulatory networks in cartilage that affect disease onset and progression, and is an outgrowth of Dr. Goldring's study of chondrocytes, the cells within cartilage tissue. "This multi-institutional collaboration will allow each scientist to think more broadly and speed up the process of discovery in a way that couldn't happen in one laboratory," says Dr. Goldring. ●

HSS Hosts International Arthritis Summit



Steven Goldring, MD



Timothy Wright, PhD

HSS will host the *Osteoarthritis Summit: Frontiers in OA Research, Prevention, and Care* in June 2011. Steven Goldring, MD, HSS chief scientific officer and St. Giles Research Chair, and Timothy Wright, PhD, director of the Department of Biomechanics and F.M. Kirby Chair in Orthopaedic Biomechanics, will chair this invitation-only summit. The meeting will provide a forum for an international, multidisciplinary group of renowned scientists, physicians, physical therapists, and industry and government representatives to discuss all aspects of osteoarthritis, including disease mechanisms, diagnosis and assessment, prevention, and treatment.

Through a series of panel discussions and breakout sessions, thought leaders will work towards a consensus on what is currently known about osteoarthritis. They will then identify priorities for a research agenda based on existing knowledge gaps.

To open the discussion to the broader community, findings from the Summit will be published in a supplemental issue of the *HSS Journal*.

Osteoarthritis is the most common form of arthritis, a leading form of disability in the United States, and the most common reason for people to need joint replacements. HSS performs more joint replacements than any other hospital in the world.

"As a world leader in osteoarthritis care and research, it is the responsibility of HSS to take a leadership role in bringing together experts to engage in an open dialogue and exchange of knowledge with the goal of creating a roadmap for future directions in osteoarthritis research, prevention, and care," says Dr. Goldring. ●

Endowed Chairs: Supporting World-Class Faculty

Special Surgery maintains nearly 20 endowed chairs, one of the highest honors awarded to its scientists. “In addition to the prestige accorded the chairholder, an endowed chair signals to the scientific community that HSS is committed to the highest quality research,” explains Steven Goldring, MD, chief scientific officer and St. Giles Research Chair. “The creation of endowed chairs has enabled HSS to recruit a community of leading research scientists at HSS. It has also attracted collaborators from around the world to work together to advance medical science. It is a cycle that every institution aspires to create.”

The economics of an endowed chair are equally beneficial. Philanthropic benefactors provide a minimum of \$2 million to endow a chair. The gift is invested according to policies established by the Hospital’s Board of Trustees. The endowment provides annual income to support the chairholder’s research, as well as income that is reinvested in the endowment to promote stability, particularly in challenging economic times, and growth in better times.



Carl Blobel, MD, PhD, (left) and Lionel Ivashkiv, MD

In this way, endowments provide a permanent source of support. “Endowments live forever,” Dr. Goldring says. “They allow donors to make a lasting contribution to the field of medicine.” To recognize the profound importance of such a gift, the Hospital will name a chair in honor of the benefactor or in accordance with the donor’s wishes. Chairs have also been named for outstanding members of the HSS medical staff.

The first endowed chair at HSS was created by Sarah Korein, a grateful patient. The chair was held by Philip D. Wilson, Jr., MD, then surgeon-in-chief. The Korein-Wilson Professorship in Orthopaedic Surgery has supported and honored successive surgeons-in-chief including the current chairholder Thomas Sculco, MD. Similarly, the Joseph P. Routh Professor of Rheumatic Diseases in Medicine supports and honors the HSS physician-in-chief Mary Crow, MD.

“Holding a chair is universally recognized by academic institutions such as HSS as a high honor,” says Dr. Sculco. “And in this very competitive environment, chairs are essential for recruiting and retaining the best talent.”

As one example, the Virginia F. and William R. Salomon Chair in Musculoskeletal Research, endowed by HSS Trustee William Salomon, was instrumental in recruiting Carl Blobel, MD, PhD. Dr. Blobel is renowned for his basic research into the mechanisms of rheumatoid arthritis.

Dr. Blobel credits the Salomon Chair with making a significant

difference in his decision to join the HSS team. “The opportunities at HSS for collaborative research were unparalleled,” he says. “In addition, I knew the Chair would allow me to fully staff my laboratory with outstanding scientists and provide the resources necessary to achieve the insights essential to discovery.”

Discovery to Recovery: The Campaign for Research and *Building on Success: Campaign for the Future of HSS* accelerated the creation of endowed research chairs as benefactors embraced the drive for new treatments and understanding of orthopedic and rheumatologic disease. “There is a direct correlation between philanthropy and the achievements of top scientific talent within our dynamic research division,” explains Lionel Ivashkiv, MD, associate chief scientific officer and David H. Koch Chair for Arthritis and Tissue Degeneration Research.

Examples of these successes include the discovery of molecules important in arthritis, lupus, and bone disease that are new therapeutic targets. ●

Caring for Our Patients

New Advances in Osteoporosis

Osteoporosis causes bones to weaken and break more easily, affecting about 10 million Americans. At Special Surgery, our doctors and scientists are developing clinical treatment protocols and examining the basic science behind the disease.

“At HSS, we see many patients who are unaware of their osteoporosis until they obtain a bone density test, or experience a fracture or impaired mobility,” explains Linda Russell, MD, attending rheumatologist and spearhead for osteoporosis intervention programs at HSS. “For these reasons we have focused our efforts on educating patients and identifying those at risk for osteoporosis, while halting disease progression.”

Pathway to Better Bones

Special Surgery rheumatologists, surgeons, nurses, and scientists have developed a new clinical pathway of care for patients with osteoporosis. “This pathway will pull together the know-how and experience of various specialty areas to provide our patients with comprehensive assessment, diagnosis and treatment of osteoporosis,” explains Dr. Russell.

Beginning in 2011, the Metabolic Bone Diagnosis and Treatment Service will identify patients with bone disease and those at risk, mapping the course for proper intervention and care while educating them

in disease management. As a starting point, the program will enlist potential candidates for spinal fusion surgery.

Pre-surgical assessment by a physician-directed nurse practitioner will occur three to six months prior to surgery, and will include bone density, blood, and urine tests. Based on results, a healthcare team comprised of rheumatologists, spine surgeons, nurse practitioners, and related specialists will collectively devise a treatment plan for each patient leading up to surgery, with the goal of maximizing bone health to ensure the best surgical outcomes.

Dr. Russell and Richard Bockman, MD, PhD, chief of the Endocrine Service at HSS, are also involved in clinical trials designed to improve the quality of patients’ bones. Says Dr. Russell: “We plan to enroll our spine fusion patients in a registry and periodically review the collected data to determine trends and evaluate how we’re doing. Through research, we can enhance treatment.”

Investigating Bone Biology

In the laboratory, HSS scientists study the causes of bone disease. Investigators say that the development of effective treatments requires a better understanding of how healthy bone forms and changes with age. “Biology will become increasingly important in the study and treatment of orthopedic disease,” says Adele Boskey, PhD, Starr Chair, Mineralized Tissue Research at HSS and renowned investigator of osteoporosis. Current investigations at HSS concentrate on

bone biology, chemistry, and the mechanics of bone growth, including how to harness bone’s natural healing power to prevent fracture and treat diseased bone. Through this research, Dr. Boskey, orthopedic surgeon Joseph Lane, MD, and biomechanical engineer Marjolein van der Meulen, PhD, have defined new predictors of fracture risk.

Translating Research to Patient Care

Drs. Boskey, Lane and colleagues are also investigating the long-term effects of bisphosphonate drugs, which suppress the natural process in which bone tissue is removed and replaced with new bone. One of the most successful categories of drugs in preventing fracture, bisphosphonates are typically prescribed to strengthen bones, but recent investigations have

found that these medications given long term may actually elevate fracture risk in some patients.

For patients who require surgery, studies point to the benefits of raising levels of vitamin D – essential for bone healing and muscle function – prior to an orthopedic procedure. Dr. Lane and colleagues found that nearly half of patients undergoing surgery have vitamin D deficiency, which can impair recovery. In these cases, vitamin D levels should be brought up to normal levels before surgery. “Since bone tissue formation is active around two to four weeks after surgery,” says Dr. Lane, “the body needs vitamin D at this time.”

HSS investigators and clinicians hope to reduce the more than 1.5 million fractures that are caused by osteoporosis each year. ●



HSS clinicians and educators taught twins Donna Polinger and Diana Wheeler-Fiveson how to stop osteoporosis in its tracks when they were diagnosed with the disease at age 50.

THE

HAPPENINGS AROUND THE HOSPITAL

HSS Builds a Running Dialogue ▾

As a sponsor of the 2010 ING New York City Marathon, HSS specialists offered tips and tools for training to runners on ING's www.nycmarathon.org website and a live Twitter feed. On the website, runners at all levels received guidance on injury prevention, cross-training, stretching, nutrition, preparation, running regimens and routines. Congratulations to all who ran the race.



Fueling Young Athletes >

Body image and proper nutrition in young gymnasts was the subject of a talk given by Sotiria Everett, registered dietician and staff nutritionist at the Women's Sports Medicine Center at HSS during the Hospital's 12th Annual Sports Medicine for the Young Athlete Symposium. "Young gymnasts have elevated nutritional needs that must be met despite constraining schedules and the pressure to stay lean," explains Ms. Everett. Coaches, trainers, and parents should watch for symptoms of undernourishment in their gymnasts, such as low energy levels, weight changes, altered moods, stress fractures, hormonal imbalance, and over-exercising. Says Everett: "Nutrition education and communication are critical to safeguarding the health and future of our budding competitors."



HSS Experts Publish Hand Surgery 'Bible' >

Green's Operative Hand Surgery, Sixth Edition is ready to reference thanks to the editorial leadership of clinician-scientists at HSS. Since 1982, *Green's* remains the go-to hand surgery textbook for medical school educators, students, and orthopedists worldwide. "Green's is what orthopedists reach for when faced with a complex question or case," says Scott Wolfe, MD, chief of the Hand and Upper Extremity Service at HSS and editor-in-chief of *Green's* latest edition. A multidisciplinary compilation, *Green's* features contributions from over 100 national and international experts, including co-editor Robert Hotchkiss, MD, director of clinical research at Special



Surgery, and HSS clinicians David Altchek, MD, co-chief, Sports Medicine and Shoulder Service, hand surgeon Michelle Carlson, MD, and anesthesiologist Michael Gordon, MD. The new edition offers a full-color format, photographs, and illustrations. It is available online, fully searchable, and provides videos and case studies on surgical techniques. "Green's is about sharing knowledge," explains Dr. Wolfe, "and translating words into results for our patients."

Nursing Honors Success in Science >

More than 100 participants gathered for the First Annual HSS Nursing Research Day on September 30, 2010, which showcased the work of Special Surgery's nursing staff. Nurses from hospitals throughout New York City shared practice developments and evidence-based research. HSS nurses presented fourteen evidence-based posters, including a study on the efficacy of thermometers.

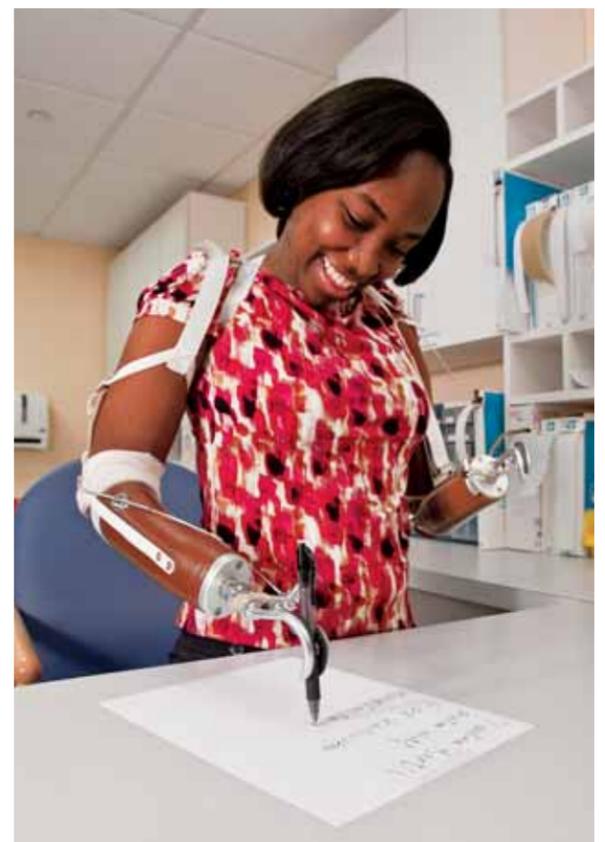
DOUBLE



On Top of the World ^

At 62, Don Healy was training to fulfill his childhood dream of climbing Mt. Everest when a broken hip put his efforts on hold. Following nine weeks on crutches, he visited a local surgeon who said he would never climb again. Mr. Healy then turned to Hospital for Special Surgery for a total hip replacement. In May 2010, at 65, Mr. Healy

became one of the oldest Americans to reach the top of Mt. Everest, and possibly the first to make it with a hip replacement. Says Thomas Sculco, MD, surgeon-in-chief: "A motivated patient can do just about anything following hip arthroplasty."



New Hope for Haitian ^ Earthquake Survivor

When the earthquake struck Haiti, Darline Bertil watched in horror as the hotel where she worked collapsed and falling stones sliced off both her hands. Five days later, U.S. troops dug her out of the rubble. HSS immediately sent a team of trauma clinicians to Haiti following the earthquake, and the HSS community remained committed to helping after the team returned to New York. When State Senator Daniel Squadron contacted the Hospital about Ms. Bertil's injuries, HSS offered to provide her with state-of-the-art mechanical limbs. With an expedited visa to the U.S., the 25-year-old received expert care at HSS thanks to Glenn Garrison, HSS director of Prosthetics and Orthotics, his team of engineers, and the generosity of the Joe and Ellen Wright Fund for Prosthetics and Orthotics. Says Mr. Garrison, "She'll learn how to use her new arms very quickly." Ms. Bertil is filled with hope. "It's a miracle," she says, "a blessing that I wish for all who are still suffering in my country."



HSS Keeps Athletes in the Game

Thousands of active people – gardeners, weekend warriors and professional athletes alike – choose Hospital for Special Surgery for orthopedic procedures each year. HSS surgeons

treat athletes, the goal is to help them return to competition. HSS surgeons conduct research that ensures that this goal is achieved through procedures like arthroscopic surgery and tissue transplantation.



Jarius Byrd, a rookie safety on the Buffalo Bills, was tied for the NFL lead in interceptions in 2009 when a hip injury took him out of the game. Following hip impingement surgery performed by Special Surgery's Bryan Kelly, MD, Mr. Byrd entered the 2010 NFL season playing strong.

are dedicated to helping all patients resume active lifestyles, whether their preferred activity is walking, playing with a grandchild, or playing professional football. When HSS physicians

medicine orthopedic surgeon and co-director of the Center for Hip Pain and Preservation.

Surgeons have previously questioned if athletes can successfully return to high-level competition after

After Arthroscopic Surgery

Hip impingement is a mechanical hip disorder that occurs when the head of the thigh bone has limited range of motion within the joint socket of the pelvic bone. Anyone can develop this condition, but athletes may develop earlier symptoms, including hip pain and inability to compete at high levels. "In activities that require a high degree of movement and significant force through the joint, there can be an earlier onset of injury," says Bryan Kelly, MD, sports

arthroscopic surgery for hip impingement. Therefore, Dr. Kelly and collaborators launched a study to review the records of 33 athletes age 17 to 56 who underwent the procedure at HSS. These patients played a variety of sports including ice hockey, soccer, baseball, swimming, lacrosse, and football.

When asked about their return to activity, nearly 80% of patients reported that they returned to play at an average of just over nine months after surgery. About 92% returned to the same level of competition they had achieved prior to surgery.

Dr. Kelly said that there are no large studies assessing return-to-play after open surgery for hip impingement, but he explained that arthroscopic surgery has a number of advantages over traditional open procedures. "Appropriately performed arthroscopic surgery results in less soft tissue trauma, less blood loss, shorter hospitalizations, and likely provides a faster recovery," he said. "This study demonstrates that there can be a high rate of return to pre-injury function with arthroscopic intervention."

After Tissue Transplantation

There has been considerable skepticism toward the success of cartilage transplantation in getting athletes back into the game. For many years, orthopedic surgeons have used cartilage transplantation, or osteochondral allograft transplantation, to treat large sections of articular cartilage damage in the knee, which may be accompanied by damage to underlying bone. These problems can be caused by traumatic sports injuries or by a congenital bone disease called

osteochondritis dissecans. In the past, cartilage transplantation only enabled patients to return to simple daily activities.

Recently, however, HSS surgeons have modified the cartilage transplantation technique with the goal of restoring patients' quality of life. Surgeons can now treat people who have this type of knee damage by transplanting a cartilage-bone graft directly into the injured area, essentially filling the hole in the cartilage. "This surgery completely fills in the damaged area and heals just like a broken bone would," explains Riley Williams III, MD, sports medicine orthopedic surgeon and director of the Institute for Cartilage Repair. The surgery is an outpatient procedure and recovery typically takes three to six months.

To find out if patients returned to sports after osteochondral transplantation surgery, Dr. Williams and his colleagues from the Sports Medicine and Shoulder Service reviewed data from the HSS Cartilage Registry of patients who underwent the procedure between 2000 and 2008. The investigators studied 25 patients under the age of 50 who participated in athletic activities at least three days per week before surgery.

Patient questionnaires revealed that only three of the 25 patients could participate in any sports prior to the surgery. Afterward, 84% of patients returned to sports and 60% returned to full athletics. The average patient could do cycling, racket sports, and light jogging.

"This is the first study to show that the majority of athletes who undergo cartilage transplantation, using our current techniques, can return to sports," Dr. Williams said. ●

News & Notes

Caspary Research Building Celebrates 50 Years

It has been 50 years since the Alfred H. Caspary Research Building – the first freestanding orthopedic research facility in the U.S. – opened its doors on November 17, 1960. Surgeon-in-Chief Emeritus Philip D. Wilson, Sr., MD, believed that establishing a separate research institute next to the Hospital would promote collaboration between clinical and research staff. Today, collaboration between scientists and clinicians is what drives research at HSS.

HSS opened its doors on the Upper East Side in 1955. Just six weeks after HSS moved to its new location, Dr. Wilson retired from his position as surgeon-in-chief to assume the new position of director of research. A true champion of orthopedic research, Dr. Wilson wrote that "medical schools and their affiliated hospitals have an obligation to the public to continue their investigative efforts for the purpose of affording help to those who are physically afflicted."

In his role as director of research, Dr. Wilson worked closely with Surgeon-in-Chief T. Campbell Thompson, MD, to lead construction

of the Caspary Research Building, made possible by a \$1.5 million gift from the estate of Alfred H. Caspary, and a \$300,000 United States Health Services Research Facilities grant. Alfred and Margaret Caspary were great friends of the Hospital, giving more than \$6 million in the 1950s.

The architectural firm of Rogers & Butler designed the five-story Caspary Building, which contained about 66,000 square feet primarily consisting of research laboratories. In 1960, the first floor housed laboratories and the Philip D. Wilson Research Foundation; the second floor contained the medical library and the Department of Education; and the upper floors housed a 50-person conference room and more laboratories. Scientists conducted research in bone mineral metabolism, collagen physiology and chemistry, and the macro-proteins in rheumatoid arthritis in a biochemistry lab on the fourth floor. The third floor contained pathology, microbiology, and immunology laboratories, and housed an electron microscope.

The Caspary Building was fully air conditioned, providing a comfortable work environment and enabling scientists to conduct

year-round research without interruptions due to variations in temperature.

On November 17, 1960, 600 people attended a dedication ceremony on the building's second floor. Tony Bennett closed the program with a song.

The Caspary Research Building remains the home for research at HSS, even as the Hospital's commitment to research has grown and evolved. During the fall of 2005, HSS successfully completed its \$115 million *Campaign for Research*. Funds raised were used to modernize laboratories, recruit and maintain world-renowned scientists, and strengthen the Hospital's research endowment. Today, more than 200 scientists and staff work collaboratively with physicians on bench-to-bedside research in tissue degeneration, autoimmunity, biomechanics, bone biology and tissue repair. This research is supported by more than \$30 million annually in funding from the National Institutes of Health, foundations, philanthropy, industry, and the Hospital. ●

knee. This is how the surgeon will help the patient avoid early-onset osteoarthritis and restore quality of life,” says Dr. Maher.

Drs. Maher and Warren’s co-investigators include Hollis Potter, MD, chief of Magnetic Resonance and Imaging, Timothy Wright, PhD, director of the Department of Biomechanics and F.M. Kirby Chair, and Assistant Scientist Matthew Koff, PhD. Outside collaborators include engineers and statisticians from Ohio State University, Rensselaer Polytechnic (RPI), and Drexel University.

Making Implants that Last

Mathias Bostrom, MD, an HSS orthopedic surgeon specializing in hip and knee replacements, wants to improve the way bones heal and grow after



Mathias Bostrom, MD

joint replacement surgery, a process called osseointegration. The goal of Dr. Bostrom’s research is to enhance bone growth into porous-coated joint replacement implants so that the implants will not loosen from the bone. Knee and hip replacements often remain successfully implanted for more than twenty years, and loosening is rare, but when loosening does occur, another (revision) surgery may become necessary.

Dr. Bostrom became interested in improving how bones and implants grow together as his clinical practice grew to include more revision surgeries, often repairing loosened joint replacements that were originally performed at other hospitals. He received an NIH grant in 2010 to support his decade-long collaboration with Cornell biomechanical engineer Marjolein van der Meulen, PhD. “At Special Surgery, there are clinicians like Dr. Bostrom who truly understand the importance of science, research, and biomechanics,” says Dr. van der Meulen.

With the new grant, Drs. Bostrom and van der Meulen will explore ways to enhance bone ingrowth into prostheses. In the lab, surgeons work with engineers to stimulate bone growth into a porous surface by applying mechanical forces (also called loads), and by administering parathyroid hormone. “We want not only to optimize the body’s own natural system

of healing, but also to augment it with better materials to promote the healing process,” says Dr. Bostrom.

Dr. Bostrom and his research fellows meet with Cornell engineers twice each week via video conferencing to discuss their ongoing research. The collaboration will provide information about whether patients should receive a bone growth hormone after surgery, and which porous surfaces are optimal for implants. It will also inform surgeons and physical therapists how much weight patients should put on their new joints post-operatively, and how soon. “I believe we’ll see major strides in the area of osseointegration in the next few years that will help us get more people back to a pain-free life,” Dr. Bostrom says.

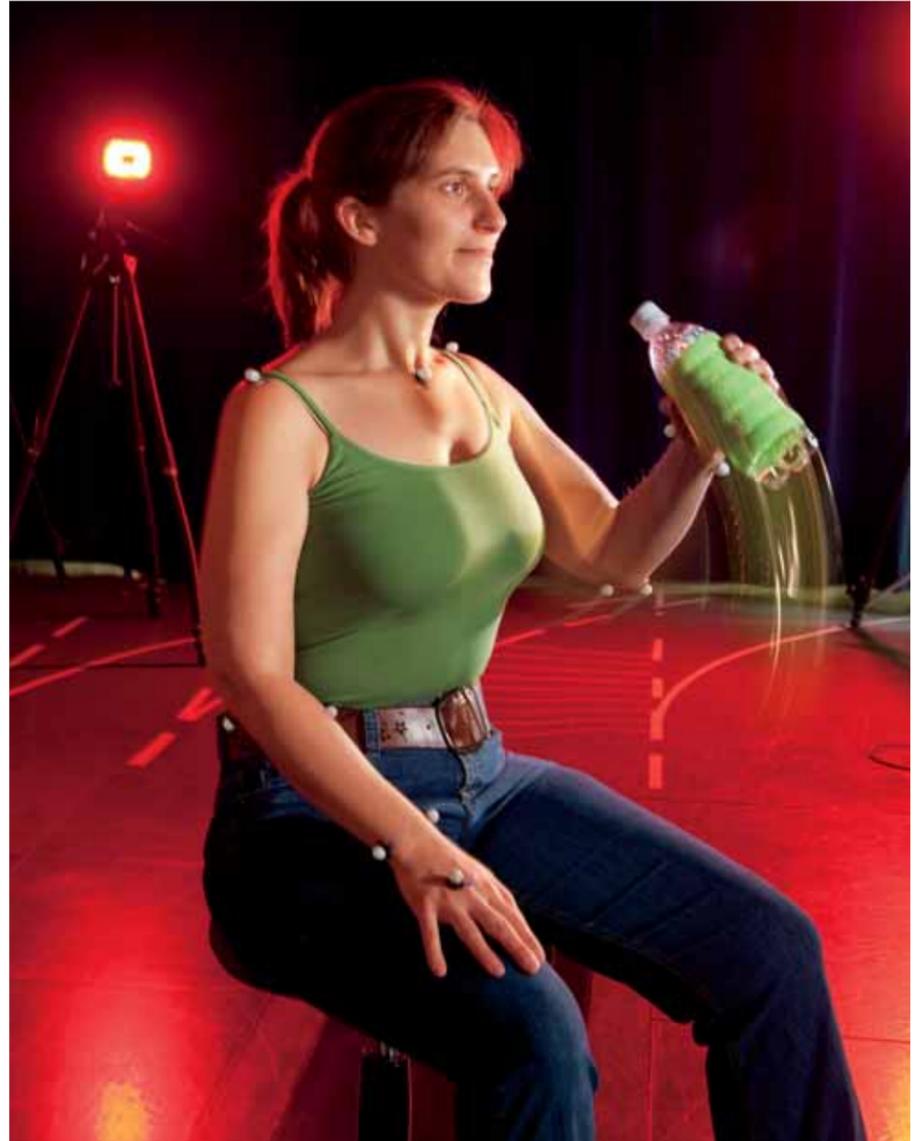
Pioneering Modern Elbow Replacements

While elbow replacement surgery is less common than hip and knee replacement, HSS surgeons and engineers are working to make the procedure more successful for patients. In the past, innovation in elbow replacement has been limited, despite the devastating disability caused by the procedure’s relatively high failure rate. Now Timothy Wright, PhD, in collaboration with HSS orthopedic surgeons Robert Hotchkiss, MD, and Mark Figgie, MD, has been awarded the first ever NIH grant to improve the performance of elbow replacements.

HSS pioneered the modern knee replacement more than 30 years ago, and this research team is now pioneering the modern elbow replacement. “We hope to move elbow replacements to where hip and knee replacements are – so patients have a greater than 90% chance that they’ll still be fine after ten years,” says Dr. Wright.

Because Drs. Figgie and Hotchkiss perform so many revision surgeries on patients whose initial elbow replacements fail (often repairing surgeries that were initially performed elsewhere), they wanted to discover why the failure rate for elbow replacements is so high. Suspecting that the problem was mechanical, they approached HSS biomechanical engineers Dr.

Wright and Joseph Lipman, MS, and their Cornell collaborator, Donald Bartel, PhD. These five investigators began to meet weekly to analyze all aspects of failed elbow replacements, looking at patient charts, x-rays, and



In the Motion Analysis Lab at Hospital for Special Surgery, engineers analyze elbow mechanics during typical elbow movements, such as raising a water bottle to the mouth.

implants retrieved from patients whose implants had failed. They soon learned that the implants showed common signs of wear and loosening, which meant that they were not handling the mechanical forces, or loads, required of an elbow.

Analyzing Elbow Mechanics

Next, the team needed to know which forces were responsible for the damage they saw on failed implants. Working with the HSS Motion Analysis Laboratory, they recorded the movements of people with total elbow replacements as they performed activities of daily living. These motion patterns were then combined with a

computer model to calculate the muscle forces responsible for creating these movements, which in turn could be used to calculate the loads directly across the elbow joint.

Using these preliminary findings of the mechanical failures sustained by elbow replace-

ments and of the forces responsible for those failures, Dr. Wright and his colleagues secured NIH funding to continue their research. They will use the funds to expand the testing of

elbow patients in the Motion Analysis Lab to create a more complete picture of the forces across the joint. They will then use those loads as inputs to computational and statistical models, similar in approach to Dr. Maher’s in her meniscus implant, to design a novel elbow implant that will remain undamaged by the forces of the elbow muscles. “We’re designing a comprehensive system for replacing the elbow, one that facilitates treating patients with a broad range of elbow problems that require replacement to relieve pain and restore function,” says Dr. Hotchkiss.

Dr. Figgie explains, “We want to give our patients a better elbow replacement that will restore function and provide the durability that we have achieved in total hip and knee replacement.”

Collaboration that Works

While the ideas for all three of these studies emerged from the surgeons’ clinical practices, the success of the ensuing research and development is due to the unique collaboration between surgeons and biomechanical engineers at Special Surgery. “Engineers provide clinicians with the mechanical background they need to solve clinical problems. The collaboration between surgeons and engineers is critical to the research we do at HSS, which is always aimed at improving outcomes for patients,” says Dr. Wright. “The NIH has confirmed its confidence in our unique approach to translational research by awarding these three new grants.” ●

For more, see www.hss.edu/biomechanics



Special Surgery biomechanical engineers compare retrieved elbow implants with x-rays to learn how elbow implants work and how they can be improved.

Recognition from Around the World

Kudos

Anne Bass, MD, received a three-year award from the NIH/National Heart, Lung, and Blood Institute (NHLBI) in collaboration with investigators from Washington University for a Genetics-InFormatics Trial (GIFT) of Warfarin to prevent deep venous thrombosis.

Adele Boskey, PhD, Starr Chair in Mineralized Tissue Research, received a four-year renewal grant from NIH/National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) for research on “FT-IR Microscopy of Mineral Structure.”

Mary (Peggy) Crow, MD, Joseph P. Routh Professor of Rheumatic Disease, received the Lifetime Achievement Award from the New York Chapter of the Arthritis Foundation.

David Dines, MD, was the lead course instructor for the AAOS/ASES “Shoulder Arthroplasty: Surgical Indications and Techniques” course held in Rosemont, Illinois. **Edward Craig, MD, MPH**, and **Joshua Dines, MD**, also served as course instructors.

Demetris Delos, MD, received the Young Investigator Grant from the American Orthopaedic Society for Sports Medicine.

Doruk Erkan, MD, spoke on “Perioperative Management of Antiphospholipid Syndrome” at Current Concepts and Controversies in Orthopedic Surgery, a symposium organized by both HSS and the Turkish Ministry of Health in Ankara, Turkey. **Dr. Erkan, Eileen McCullagh, RN**, and **Robert Spiera, MD**, presented at the Third Annual Rheumatology Nurses Society Meeting in Chicago.

Maureen Firth, MS, RT, (R)(M)(QM), was elected Chair of the Association for Medical Imaging Management’s Education Foundation at the 38th Annual Meeting and Exposition, and was appointed to the faculty of AHRA’s Leadership Institute.

Mary Goldring, PhD, Ira W. Decamp Fellow in Musculoskeletal Genetics, was an invited speaker at the NIH/National Institute on Aging Workshop; the European Cells and Materials Conference in Davos, Switzerland; the 23rd Annual Meeting of the Japanese Society of Cartilage Metabolism in Kagoshima, Japan; and the Joint Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology and the International Society for Magnetic

Resonance in Medicine in Stockholm, Sweden, where **Steven Goldring, MD**, also presented.

Steven Goldring, MD, St. Giles Research Chair, was an invited speaker at the Annual Meeting of the Osteoarthritis Society International in Brussels, the EULAR Congress in Rome, and the European Workshop on Rheumatology in Bamberg, Germany. He also served on the organizing committees for the Annual Sun Valley Workshop in Musculoskeletal Biology and the Third Annual Osteoimmunology Meeting in Santorini, Greece.

Jo Hannafin, MD, PhD, received the Distinguished Alumnus Award from the Einstein-Montefiore Orthopaedic Program.

Howard Hillstrom, PhD, received a three-year award from NIAMS in collaboration with the University of North Carolina Chapel Hill to study the genetics of foot disorders.

Xiaoyu Hu, MD, PhD, received the Christina Fleischmann Memorial Award for Young Women Investigators from the International Society for Interferon and Cytokine Research, and a five-year award from the NIH to study “Selective Regulation of Macrophage Activation.”

Carl Imhauser, PhD, received a one-year Planning Grant via the Weill Cornell Medical College Clinical and Translational Science Center to study a new method of assessing knee stability after ACL reconstruction.

Bryan Kelly, MD, received the 2011 Excellence Award from the American Orthopaedic Society for Sports Medicine for his paper, “Surgical Treatment of Femoroacetabular Impingement (FAI) Improves Hip Kinematics: A Computer-Assisted Model.”

Dale Lange, MD, was elected president of the New York State Neurological Society for 2011-2013.

Michael Lockshin, MD, was honored at the American College of Rheumatology Meeting in Atlanta, GA, for serving as editor-in-chief of *Arthritis & Rheumatism*, 2005-2010.

Theresa Lu, MD, PhD, William T. Morris Fellow in Pediatric Rheumatology, was elected to membership in the American Society for Clinical Investigation.

Stephen Lyman, PhD, was appointed to the FDA Center for Devices and Radiological Health Medical Devices Advisory Committee.

Carol Mancuso, MD, received a five-year Career Investigator Award in Patient-Oriented Research from the NIH/National Heart, Lung, and Blood Institute for “Trial of Asthma Self-Management Education in Patients with Depressive Symptoms.”

Joseph Markenson, MD, gave an invited talk on “Efficacy and Safety of T-Cell Modulation in Rheumatoid Arthritis” at the 14th International Congress of Immunology held in Kobe, Japan; lectured at the Rheumatology Society in Osaka and Tokyo; and addressed the Rheumatology Society in Knysna, South Africa.

Robert Marx, MD, was Visiting Professor at the West Point Army Soft Tissue Trauma Fellowship, lecturing on “Decision-making for MCL Reconstruction.”

Kenneth Ng, PhD, a postdoctoral fellow in the laboratory of **Suzanne Maher, PhD**, completed a year-long tenure as Associate Scientific Advisor for the journal *Science Translational Medicine*.

Hollis Potter, MD, served on the NIAMS panel for the review of Centers of Research Translation grant applications, and was elected Member of the International Scientific Advisory Board, Austrian Science Fund, and Medical University of Vienna.

Scott Rodeo, MD, gave the Charles F. Gregory Memorial Lecture at the University of Texas Southwestern Medical Center in Dallas, and was Visiting Professor at the University of Pennsylvania.

Inez Rogatsky, PhD, Robert and Gillian Steel Fellow in Musculoskeletal Research, received an ARRA award from the NIH/National Institute of Allergy and Infectious Diseases for continued studies of “Mechanisms of Immunosuppressive Actions of Glucocorticoids.”

Sergei Rudchenko, PhD, received a Pilot Award via the Weill Cornell Medical College Clinical and Translational Science Center to study “Androgen Regulation of Endothelial Progenitor Cells and Endothelial Cells.”

Jane Salmon, MD, Collette Kean Research Chair, was invited by the Swedish Society of Physicians to lecture at the Soderberg Symposium in Stockholm.

Thomas Sculco, MD, Korein-Wilson Professor in Orthopaedic Surgery, and **Timothy Wright, PhD**, organized the

Sino-HSS Symposium on Total Knee Arthroplasty in Beijing, in collaboration with Dr. Yan Wang of the 301 General Hospital of the People’s Liberation Army. The Symposium attracted the leading knee replacement surgeons from throughout China to discuss topics related to knee arthroplasty in an attempt to reach consensus on issues and challenges by contrasting the Chinese and HSS experiences. **Russel Huang, MD, Joseph Lipman, MS**, and **Douglas Padgett, MD**, also participated in the Symposium. Drs. Sculco, Wright and Mr. Lipman also presented invited lectures to orthopedic surgeons throughout China and Taiwan.

Ora Singer, MD, a recent graduate of the HSS rheumatology fellowship program, received the 2010 ACR Distinguished Fellows Award.

Seth Waldman, MD, received a two-year grant from the NIH via the Weill Cornell Medical College Clinical and Translational Science Center for “Implementation of Electronic Medical Records to Initiate a Chronic Pain Registry.”

Russell Warren, MD, was Visiting Professor and held the Haddad Lectureship at Tulane University.

Andrew Weiland, MD, received the 2010 American Orthopaedic Association’s Distinguished Clinician Award.

Scott Wolfe, MD, was an Invited Guest Lecturer at the 66th Pan Hellenic Orthopedic Society meeting held in Athens, Greece, and presented four separate podium presentations at the American Society for Surgery of the Hand Annual Meeting.

Timothy Wright, PhD, F.M. Kirby Chair in Orthopaedic Research, and **Art Sedrakyan, PhD**, received a one-year contract from the FDA to develop a scientific infrastructure for the Consortium of Orthopedic Registries. Dr. Wright was invited to represent the Orthopaedic Research Society at a meeting held by the Center for Devices and Radiologic Health of the FDA.

www.hss.edu received the Gold Award for Best Overall Site from the eHealthcare Leadership Awards. ●

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ACR Awards Highest Honor to Three HSS Faculty

The American College of Rheumatology (ACR) honored three Hospital for Special Surgery faculty members with the designation of Master at the 74th Annual Scientific Meeting in November 2010: Chief Scientific Officer Steven Goldring, MD, Physician-in-Chief Emeritus Stephen Paget, MD, and Attending Rheumatologist Joseph Markenson, MD.

This recognition is one of the highest that the organization bestows. Eligible members are those age 65 and older who have made outstanding contributions to the

rheumatology profession through academic achievement and service to patients and students. No more than 15 Master designations are awarded each year.

“It is remarkable that three rheumatologists from one institution would be honored by being named Masters,” said Mary Crow, MD, physician-in-chief and chair of the HSS Division of Rheumatology, who is a past president of the ACR. “Each of these Special Surgery experts has significantly contributed to the field of rheumatology.”

Dr. Goldring oversees basic, clinical, and translational research at HSS and has been a leader in the

field of bone remodeling research. Dr. Paget served as Special Surgery’s physician-in-chief and chair of the Division of Rheumatology from 1995 to 2010, and today continues his longstanding research on the development and treatment of rheumatoid arthritis, lupus, and related conditions. Dr. Markenson has been a lead investigator of many studies and clinical trials on new drugs for people who have rheumatic diseases, including rheumatoid arthritis, osteoarthritis, and lupus. ●

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Our Physicians
**ADVANCING
SPINE
SCIENCE**

**Matthew Cunningham,
MD, PhD**

Spinal fusion surgery induces the “knitting together” of vertebrae into a single, solid bone, providing help for chronic back pain and spine deformities.

“In youngsters like Jessica (see other side), the challenge is to correct and stabilize the spine while preserving as much potential bone growth as possible,” explains Matthew E. Cunningham, MD, PhD, assistant attending orthopedic surgeon and scientist at HSS, who is seen here viewing Jessica’s x-rays from before and after her surgery.

Dr. Cunningham and HSS scientists are investigating a noninva-

sive technique for spine fusion that may reduce the need for surgery in many cases, promote faster healing for degenerative disc disease, and serve as an early intervention for progressive scoliosis. The method involves harnessing the healing power of bone morphogenetic proteins (BMPs), which support bone and cartilage development. Studies suggest that an injection of BMP into the spine discs may allow new bone growth and spine fusion to follow.

“We could minimize time in the operating room and decrease or eliminate hospital stays,” says Dr. Cunningham, “while posing less risk and anxiety to patients.”



Our Patients

RUNNING TOWARDS THE FUTURE

Jessica Boertzel

At 14, Jessica Boertzel participated in a scoliosis screening at her school that led to a diagnosis of severe spine curvatures of more than 80 degrees.

Jessica was referred to HSS where she was seen by Matthew E. Cunningham, MD, PhD (see other side), who told her she needed spinal fusion surgery to straighten and stabilize her spine. "Dr. Cunningham was very clear about what to expect," says Jessica's mother, Joan. "We had complete trust in him."

In July 2009, Jessica underwent a six-hour procedure in which metal rods and screws

were attached to her spine, and the scoliosis was corrected. The instruments help the bones to fuse, and remain in place after fusion to reinforce the spine correction, minimizing the need for further surgery.

One year later, 16-year-old Jessica is 2 inches taller with only 30 degree curves. She can participate fully in all typical teen activities and outings, like a run on the beach.

"I'm so thankful to Dr. Cunningham and the staff at HSS," says Jessica. "I feel great and positive about the future."