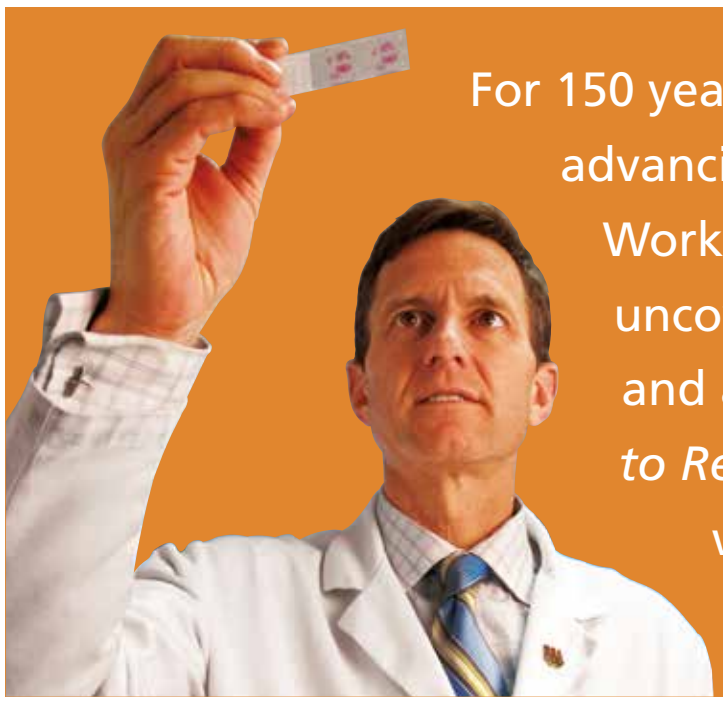
Discovery to Recovery

HOSPITAL FOR SPECIAL SURGERY

150 YEARS

CLINICAL AND RESEARCH HIGHLIGHTS AT HSS | SPRING 2013



For 150 years, Hospital for Special Surgery has led the way in advancing the fields of orthopedics and rheumatology. Working together, our physicians and scientists have uncovered new treatments for arthritis, broken bones, and autoimmune disease. This special issue of *Discovery to Recovery* celebrates the HSS spirit of innovation as we continue to make breakthroughs in surgery, prevention, and the understanding of disease.

Inventing the Modern Total Knee Replacement

Total knee replacement is one of the most popular orthopedic surgical procedures in the world and the only cure for advanced knee arthritis. This life-changing surgery is an important part of HSS's history, current practice, and vision for the future.

A team of HSS surgeons and engineers designed the total condylar knee implant in the 1970s, leading the way for millions of people with advanced knee arthritis to lead active, pain-free lives.

A Game Changer: Discovering the Modern Total Knee

In 1969, when John N. Insall, MD, became the chief of the HSS Knee Clinic, there was no reliable knee implant on the market. When patients had debilitating knee arthritis, their best option was often the temporary relief of pain medication. Seeking new hope for their patients, Dr. Insall worked with HSS surgeons Chitranjan Ranawat, MD, Allan E. Inglis, MD, and biomechanical engineer Peter Walker, PhD, to design and develop the modern total knee implant, called the total condylar knee.

Dr. Insall and Dr. Ranawat first used the total condylar knee with patients in 1974.

For the first time, a knee implant recreated the way a real knee works, allowing patients to move naturally and without pain. "This knee was a game changer," says Chief Scientific Officer Steven R. Goldring, MD, Richard L. Menschel Research Chair. "The total condylar knee gave patients with advanced knee arthritis a chance to live without pain."

The total condylar was the first implant to address all aspects of the knee with anatomically shaped parts. Previous implants were cumbersome for surgeons to implant. Surgeons across the country appreciated the total condylar's design and began to use it with their patients.

Today's Patient-Centered Research

Since 1974, HSS physicians, scientists, and engineers have continued to advance knee prostheses, dramatically increasing implant longevity and developing better implant materials. They now track long-term patient outcomes through a joint replacement registry that enrolls more than 30,000 participants and analyze retrieved implants at the Mary and Fred Trump Institute for Implant Analysis, in order to understand how the implants have performed and improve that performance.

Award-winning actress Rhea Perlman traveled to HSS from the West Coast for knee replacement surgery. She quickly bounced back to her very active life.

Today, our research team is turning its attention to other areas of research, including developing new materials that address soft tissues and improving patients' results throughout the pathway of care, from presurgery through rehabilitation, to improve overall outcomes.

"The partnership between surgeons and engineers that resulted in the invention of the modern knee replacement continues to drive innovation at HSS," says Surgeon-in-Chief Thomas P. Sculco, MD. "We perform more than 9,000 hip, knee and other joint replacements each year – more than any other hospital

Continued on page 6

Hospital for Special Surgery
535 East 70th Street
New York, NY 10021
www.hss.edu

Nonprofit Org.
U.S. Postage
Paid
Permit #186
Lakewood, NJ 08701

Promise for a Bright Future

At HSS, 2013 marks our 150th anniversary, offering an opportunity to celebrate our past accomplishments and future promise. Dr. James Knight founded the Hospital, first called the Hospital for the Ruptured and Crippled, on Sixth Street and Second Avenue in 1863 during the Civil War. The original 28-bed hospital treated impoverished children with disabilities, bringing them hope for a better quality of life.

Through decades of continuous growth and medical progress, HSS has become the world leader in orthopedics and rheumatology, training generations of specialists and advancing medicine through research. We have remained committed to providing compassionate care to our patients and helping them to achieve the best quality of life possible. This focus on our patients has positioned us well for leadership in our specialty areas, now and in the future.

This is the first of two special anniversary issues of *Discovery to Recovery*. You will read about many of the orthopedic discoveries, inventions and innovations that have originated at HSS with far-reaching impact on patients around the globe, including implants and surgical techniques for every joint in the body. In the next special issue, we will feature the rheumatologists who unravel the mysteries of autoimmune and inflammatory diseases, identifying and improving treatment pathways that allow patients to feel well and enjoy life.

HSS research is successful because our clinicians, engineers, and laboratory scientists collaborate to uncover new ways to help our patients live the lives they choose, and we always seek ways to improve what we do. We hope you enjoy reading about the Hospital's rich research history and the current research that will advance the medicine of movement for patients of the future.

Louis A. Shapiro
President and CEO

Thomas P. Sculco, MD
Surgeon-in-Chief

Steven R. Goldring, MD
Chief Scientific Officer

The Osteoarthritis Initiative: The Power and Potential of Interdisciplinary Research

Osteoarthritis (OA), the painful and often debilitating disease in which cartilage breaks down until it can no longer serve its function as a cushion between the bones, is the most common underlying condition that brings patients to Hospital for Special Surgery. For decades, our scientists have conducted research to better understand the disease. While the symptoms of OA are well-known, scientists are still uncovering its root causes. The only cure for advanced OA remains joint replacement.

Mary Goldring, PhD, studies genetic activity in cartilage to learn how genes work in osteoarthritis. Understanding the disease will lead to new methods of prevention and treatment.

An interdisciplinary team of HSS scientists and physicians investigates how OA works, with the goal of developing methods of prevention and, ultimately, a cure. More than 350 clinicians, clinical investigators, and basic scientists across the Department of Orthopedics, the Division of Rheumatology, and the Research Division at HSS are addressing OA on some level, and 15 OA-related research grants are well under way.

In recent years, the Hospital's OA research efforts have been formalized through the leadership support of the Starr Foundation, Li Ka Shing Foundation, National Institutes of Health, and many other private and public donors who have enabled HSS to establish the Osteoarthritis Initiative – an integrated basic, translational, and clinical research program to advance OA research.

Uncovering the Biology of Joint Tissues

Mary Goldring, PhD, director of the Laboratory for Cartilage Biology and the Ira W. DeCamp Fellow in Musculoskeletal Genetics, examines genetic activity in cartilage along a continuum from normal tissue to progressive OA. Her goal is to identify targets for therapy to block damage to the cartilage and promote its repair.

"We are trying to understand the molecular biology of the cells within the cartilage under normal conditions and how the activities of those cells change when cartilage is damaged," says Dr. Goldring, who is the recipient of a Director's Award from the NIH. Her laboratory has uncovered new roles of genes not previously known to act in cartilage, and she and her colleagues are studying the genetic mechanisms that promote the progression of OA.

HSS physician-scientist Scott A. Rodeo, MD, successfully performed three surgeries that allowed Sara Bako to move without pain despite severe knee osteoarthritis.

This research is important because understanding how genes work in a disease is the first step toward developing therapies to prevent the disease from progressing. Follow-up studies may lead to the identification of critical targets for therapy to block the initiation of cartilage damage or even promote cartilage repair with cell-based tissue-engineering approaches.

The Multiple Roles of MRI

Today's magnetic resonance imaging (MRI) techniques in orthopedics – many developed by Hollis G. Potter, MD, chief, Division of MRI and the Coleman Chair in MRI Research – have made it possible for the first time to identify deficiencies in joint tissue following an injury that are associated with the very early onset of osteoarthritis.

With support from the NIH, Dr. Potter uses non-invasive MRI to explore the structural components

Continued on page 8

HSS: 150 Years of Advancing Medicine through Research

Research is key to the HSS mission. Our scientists and physicians work together to discover new technologies, treatments, and surgical techniques to improve patients' quality of life now and in the future.

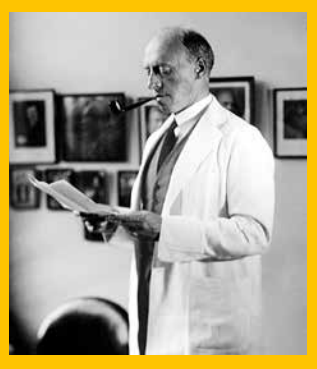
In Dr. James Knight's Orthopaedia, *his practical treatise on the aberrations of the human form, he illustrates a brace used to treat genu valgum, commonly known as "knock-knees."*

1874

1934

HSS adds a new floor for laboratories. Under the leadership of R. Garfield Snyder, MD, director of the Arthritis Clinic, HSS conducts one of the earliest scientific studies in New York City of the causes behind chronic arthritis.

The Caspary Research Building opens – the first freestanding orthopedic research facility in the country. It was built under the leadership of Surgeon-in-Chief Emeritus Philip D. Wilson, Sr., MD, who assumed a new position as HSS's first director of research in 1955.



1960

Inflammatory Arthritis: Collaboration Between Specialties

Since HSS established its first arthritis clinic in the 1920s, our rheumatologists and orthopedic surgeons have worked together to care for patients with inflammatory arthritis. Their collaboration extends to research, where clinical experience inspires investigation, and findings are integrated into patient care.

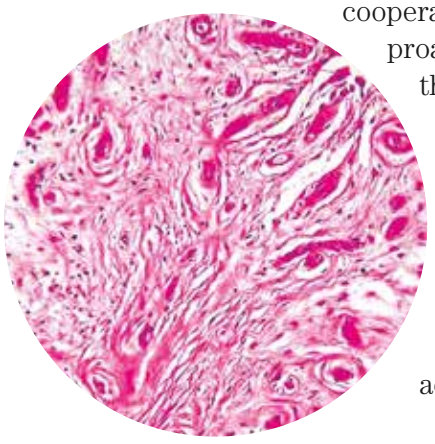
"Within their specialties and across disciplines, our rheumatologists, orthopedic surgeons, and basic scientists are expanding the understanding of inflammatory arthritis and its treatment," says Mary K. Crow, MD, physician-in-chief and chairman, Division of Rheumatology, and the Benjamin M. Rosen Chair in Immunology and Inflammation Research.

Extraordinary Advances

Until recently, most patients with rheumatoid arthritis developed severe joint damage that often required multiple orthopedic surgeries. Treatment for people with inflammatory arthritis has been transformed by disease-modifying drugs that became available in the 1980s, and by medications that target inflammatory proteins, called biologics, that were approved by the FDA in the 1990s. These medications protect joints from debilitating inflammation and often make surgery unnecessary. Today at HSS, some 70 percent of patients with rheumatoid arthritis (RA) are on medications that modify the body's immune response, and more than 50 percent are on a biologic. Despite these therapeutic advances, however, orthopedic surgery continues to play a significant role for patients with RA.

Forty years ago, when surgery was still the norm for people with inflammatory arthritis, Charles L. Christian, MD, then chief of the Division of Rheumatology, along with former Division Chief Richard H. Freyberg, MD, and orthopedic surgeon Lee Ramsey Straub, MD, conceived the Comprehensive Arthritis Program (CAP) – an interdisciplinary program unique for its time. Today, under the direction of rheumatologist Susan M. Goodman, MD, and orthopedic surgeon Mark P. Figgie, MD, the program's rheumatologists and orthopedic surgeons continue to co-manage one of the largest populations of patients with inflammatory diseases in the world, including people with inflammatory arthritis who need surgery.

Building on the success of its cooperative clinical approach, HSS established the Surgical Arthritis Research Group in which rheumatologists, orthopedic surgeons, and basic scientists conduct collaborative research to advance treatments for inflammatory arthritis.



HSS scientists investigate the hows and whys of inflammatory disease with the goal of developing improved treatments for patients.

Surgical Success

A new study by Dr. Goodman, Dr. Figgie, rheumatologist Lisa Mandl, MD, MPH, and orthopedic surgeon Michael M. Alexiades, MD, finds that joint replacement in patients with RA can be highly successful.

"Patients with inflammatory diseases are frequently at high risk for renal, pulmonary, cardiac, and other complications," says Dr. Goodman. "The success of their surgery is influenced by many factors associated with their disease."

While patients with RA historically had higher rates of postoperative complications, it was unclear if this was the case in patients on disease-modifying drugs or biologic agents that target inflammatory proteins. Analyzing data from the HSS Total Joint Replacement Registry, the investigators compared contemporary total knee replacement outcomes in patients with osteoarthritis to those with RA under treatment with these medications.

HSS basic scientists Gisela Weskamp, PhD, and Carl P. Blobel, MD, PhD.

"Prior to surgery, patients with RA had worse pain and function and lower perceived health status compared to patients with osteoarthritis," says Dr. Figgie. "However, we found that operative time and length of stay in the hospital were the same in both groups. Neither group experienced deep joint infections. Both sets of patients had comparable complication rates."

"The study shows that infection and wound healing are not increased in patients with RA who undergo knee replacement, at least in a high-volume hospital," adds Dr. Goodman. "When their disease is controlled with medication, RA patients can expect excellent outcomes."

Uncovering New Treatment Options

HSS laboratory scientists continue to investigate how inflammatory diseases work, with the goal of developing new therapeutic interventions. For example, Program Director Carl P. Blobel, MD, PhD, and his team in the Arthritis and Tissue Degeneration Program have learned how a family of molecules, called ADAMS, regulates an inflammation-causing protein, called TNF alpha. Most recently, they identified a potential mechanism to inactivate TNF alpha conversion in immune cells without affecting its function in other organs. "This is an important finding, as it opens the door to the possibility of treatments for inflammatory diseases with small molecules that could be taken as pills, cause fewer side effects, and be less expensive than current therapies," says Dr. Blobel.

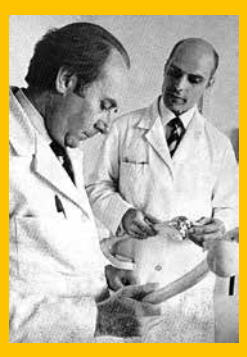
Supporting Future Research: The Allan E. Inglis, MD, Chair

To ensure continued support of clinical research and education in orthopedics, inflammatory and rheumatoid arthritis, the Hospital has initiated the Allan E. Inglis, MD, Chair in Surgical Arthritis, recognizing Dr. Inglis's years of remarkable service at HSS (1961-1991), in which he cared for patients with inflammatory arthritis and educated future surgeons.

"Allan Inglis was an innovative surgeon and a great educator," says Dr. Figgie, who is the first holder of the chair. "The Allan Inglis Chair has been established to promote cooperative research for problems facing patients with inflammatory diseases, including rheumatoid arthritis and juvenile idiopathic arthritis." A fundraising campaign to fully endow the Inglis Chair is currently under way, as the Hospital continues to seek support to advance efforts that will improve clinical care and outcomes for patients living with these conditions.

1974

Surgeons and engineers (including Dr. John N. Insall and Dr. Chitranjan Ranawat, at right) collaborate to design the original total condylar knee – an outstanding achievement of implant design that becomes the prototype of modern knee replacement. Three years later, HSS becomes the first hospital to make custom-designed orthopedic implants.



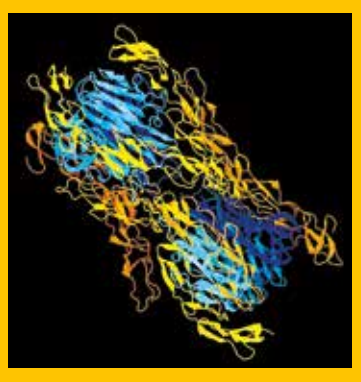
1995

In the 1990s HSS scientists develop new ways of treating autoimmune diseases with biological agents in combination with the latest innovations of tissue engineering and gene therapy.

2002

HSS launches the Campaign for Research: Discovery to Recovery, *a $115 million fundraising drive to recruit and retain world-class research faculty and modernize the Caspary Research Building.*

2013



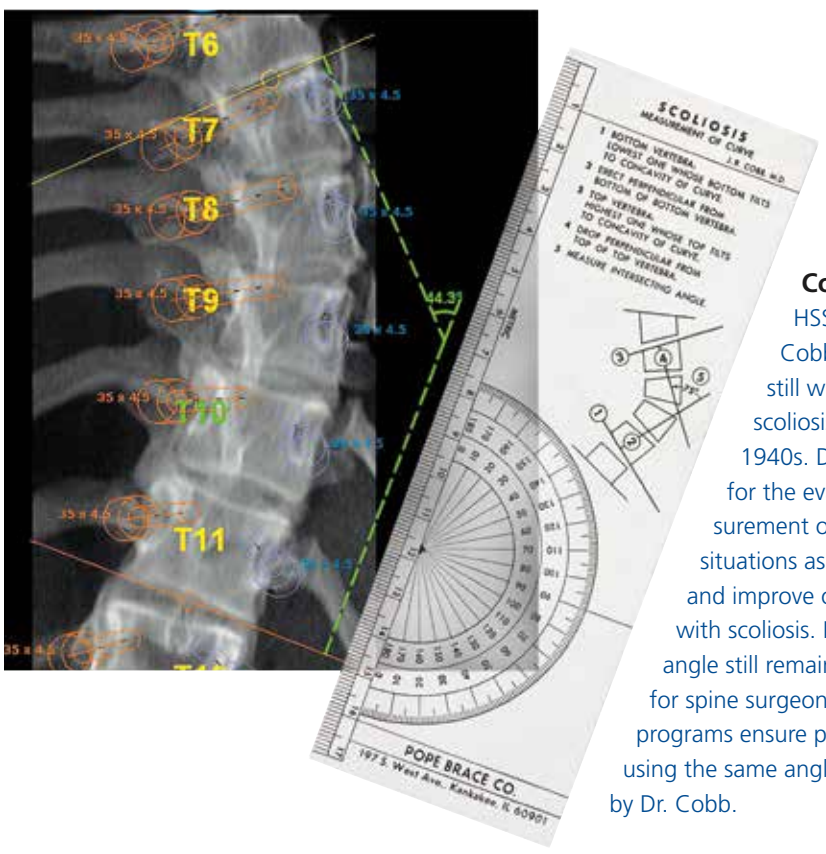
HSS scientists continue to make breakthrough discoveries about the causes of autoimmune diseases, providing exciting opportunities for new drug therapies. For example, studies have identified a treatment approach that can block a protein called tumor necrosis factor (3-D model shown) linked to rheumatoid arthritis.

Orthopedic Inventions Expand the Possibilities of Movement

Innovation has always been at the heart of the HSS mission. When Dr. James Knight first opened the Hospital for the Ruptured and Crippled in 1863, the very idea of a hospital dedicated to the care of children with severe physical disabilities was new.

When Surgeon-in-Chief Philip D. Wilson, Sr., MD, established the Research Division in 1955, he harnessed the spirit of innovation that has always been integral to the HSS culture and created a new infrastructure for scientists and physicians to work together to advance the medicine of movement. This collaboration between clinicians, biomechanical engineers, and laboratory scientists has produced extraordinary inventions and discoveries that have helped patients around the world enjoy better, more active lives.

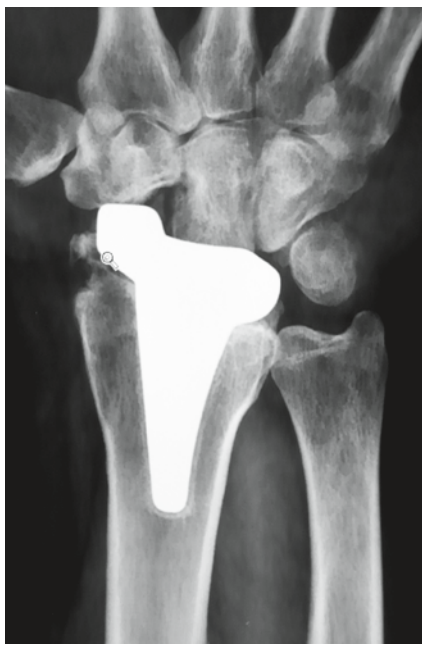
Whitman Plates
HSS surgeon Royal Whitman, MD, invented this contoured arch as a cure for flat feet in 1907. Dr. Whitman believed that static support was needed to fix the anatomy of the foot. Whitman Plates are still used today.



Cobb Scoliosis Angle
HSS spine surgeon John Cobb, MD, invented a still widely used method of scoliosis measurement in the 1940s. Dr. Cobb advocated for the evaluation and measurement of angles in clinical situations as a way to understand and improve outcomes for patients with scoliosis. Measuring the Cobb angle still remains a routine task for spine surgeons. Today, computer programs ensure precise measurement using the same angle system developed by Dr. Cobb.

The First Modern Knee Implant
In 1969, HSS surgeons John N. Insall, MD, Chitranjan Ranawat, MD, Allan E. Inglis, MD, and biomechanical engineer Peter Walker, PhD, began to design and develop the modern total knee implant, called the total condylar knee, which was first used in patients in 1974. The total condylar was the first knee implant to recreate the way a real knee works, allowing patients to move naturally and without pain. HSS surgeons have performed more than 55,000 knee replacement surgeries, more than any other hospital.

A New Kind of Wrist
Scott Wolfe, MD, chief emeritus of the Hand and Upper Extremity Service, has invented a new wrist implant and partial implant that for the first time mimic how the wrist really works. Until now, experts believed that the wrist moved the hand in two planes – up and down and side-to-side. Dr. Wolfe and biomechanical engineer Joseph Crisco of Brown University demonstrated that many of the wrist's important functions – throwing a ball, hammering a nail, pouring a glass of water – actually combined a movement between these planes: the so-called "dart-thrower's motion." The new implants were born out of this discovery.



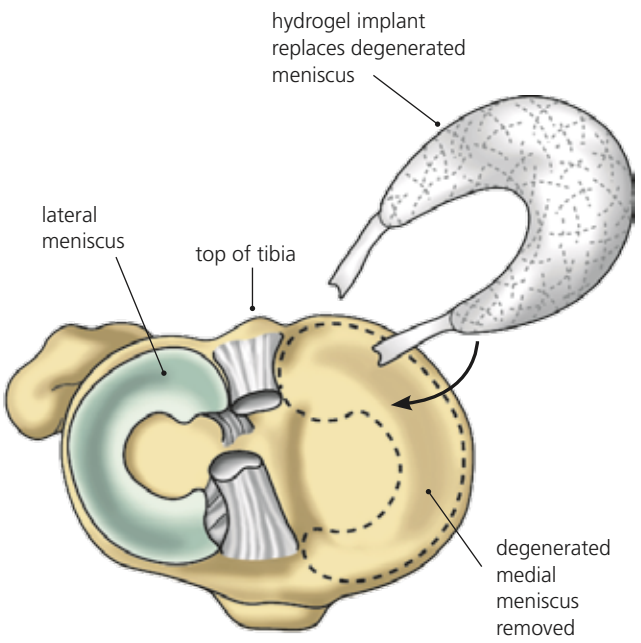
HSS inventions impact the real world because the goal of their development is always improved patient care. “Often there is no commercial motivation for this highly skilled group of experts to devote so much time to developing a new product. They are doing it for their patients and because they love to solve problems,” says Donna Rounds, PhD, director of Technology Development at HSS.

These pages highlight a few HSS inventions.

Ex-Fix for Elbow Mobility
Upper extremities surgeon Robert Hotchkiss, MD, and a team of biomechanical engineers have invented an external fixator device (“Ex-Fix”) that will greatly improve recovery for people with elbow injuries. Casts or hinge-based frames typically hold the elbow in one position during recovery, causing the elbow to remain very stiff once the cast is removed. The Ex-Fix is adjusted and temporarily “unfixed” as the elbow heals, allowing patients to conduct appropriate rehabilitation exercises, which will give patients full range of motion once their injury heals. Because of its proposed simplicity of installation, the Ex-Fix will be ideal for use at trauma sites.

Improving Hip Replacement Accuracy
To improve accuracy of hip implant cup placement into the pelvic bone during hip replacement surgery, HSS surgeon Chitranjan Ranawat, MD, and engineer Joseph Lipman, MS, are developing a method of using CT scan and X-ray images taken of patients prior to surgery to determine the precise cup position for each individual patient. Guided by these patient-specific images, engineers can use computer-aided modeling to plan and orient the cup position before surgery. The team is also developing special instrumentation and a novel surgical technique to make this a very surgeon-friendly product.

Spinal Fusion Instrumentation
A team of HSS spine surgeons and biomechanical engineers including Federico Girardi, MD, Andrew Sama, MD, and Joseph Lipman, MS, developed a comprehensive spinal fusion system that entered the market in 2007. The system incorporates some 50 pieces, including multiple color-coded screws, a tap sized for each screw, various rod configurations with slightly different curvatures to match the particular location in the spine, and measuring tools to ensure precision in complex spinal fusion surgery. This system helps surgeons perform efficient, safe surgeries so that patients will have better results.



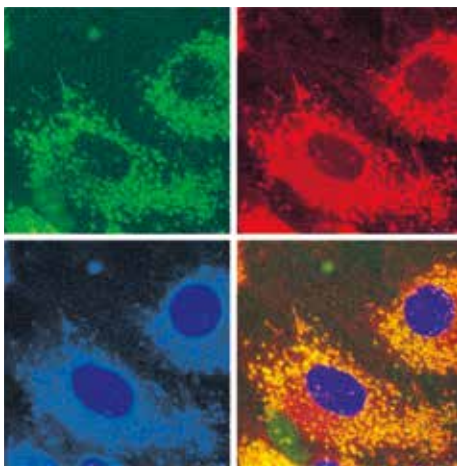
New Materials: Hydrogel
A team of HSS scientists and clinicians led by biomechanical engineer Suzanne Maher, PhD, has invented novel synthetic implants to replace cartilage damaged in common sports injuries. The materials are designed to closely mimic healthy cartilage with the goal of slowing or preventing the progression of osteoarthritis, which often develops following an injury. The implants will be used to replace injured cartilage anywhere in the body, for example articular cartilage and the menisci.

New Technologies to Treat Inflammation and Pain

HSS scientists are developing new technologies in the laboratory with the goal of helping our patients detect and treat surgical complications and pain.

Fighting Inflammation with Nanoparticles

While most people do well for many years after a knee replacement, its most common long-term complication, called osteolysis, occurs when wear debris from the breakdown of the implant breaks off and accumulates in surrounding tissues. These foreign particles cause the body to induce an inflammatory reaction. During this reaction, the tiny implant particles get carried between the implant and the bone, causing bone destruction and implant loosening, which can lead to the need for a revision surgery.



Imaging agents in nanoparticles show early signs of osteolysis, leading the way for new treatment options.

In the HSS Osteolysis Lab, Director Ed Purdue, PhD, Surgeon-in-Chief Thomas Sculco, MD, Chief Scientific Officer Steven Goldring, MD, and colleagues have identified how implant debris particles activate cells to induce an inflammatory reaction. This discovery, published in the *Journal of Orthopaedic Research* in 2012, will help determine which medications may stop this reaction from occurring. "You need to understand how the cells react to cause inflammation before you can develop a therapeutic intervention. Our hope is that our discovery in the laboratory will be quickly translated into a cure for patients, allowing them to avoid the need for revision surgeries," says Dr. Goldring.

Robert Hotchkiss, MD, uses his expertise as a surgeon to research new solutions for patients.

Scientists in the Osteolysis Lab have also worked with outside collaborators to invent a novel way of using nanoparticles to deliver medication directly to inflammatory cells. These nanoparticles are so small that they themselves do not trigger an inflammatory reaction. Imaging agents can also be added to the nanoparticles to detect inflammation before noticeable symptoms occur.

A Novel System for Treating Pain

Another team of HSS inventors led by Robert Hotchkiss, MD, an upper extremities surgeon and medical director of clinical research at HSS, has invented a new way to potentially reduce pain and inflammation – a patented, small reservoir containing medication that is implanted into a joint to locally and steadily deliver a drug dose over several months.

Inventing the Modern Total Knee Replacement continued from page 1

in the world. Our team is devoted to identifying areas where we can achieve even higher standards across the pathway of care."

When Two Knees Are Needed

Patients often require the replacement of both knees. For years, surgeons have debated which of the three surgical options is safest for patients:

- both surgeries at the same time (called simultaneous or single-stage bilateral),
- separate surgeries staged a few days apart during the same hospitalization, or
- separate surgeries separated by a few months.

HSS anesthesiologist and intensivist Stavros G. Memtsoudis, MD, PhD, has studied risk factors for bilateral knee replacement surgery. He and his colleagues, including Surgeon-in-Chief Thomas P. Sculco, MD, published a 2009 study that found that the risk of complication in bilateral procedures increases when patients have certain risk factors, including pulmonary hypertension, increased age, renal disease, and history of heart disease. They also found that staging two knee replacements several days apart during the same hospitalization increases the risk of adverse events.

Based on this research, HSS changed its guidelines to determine which patients are good candidates for bilateral surgery. "Bilateral knee replacement is a safe and effective procedure, but patients must be selected carefully," says Dr. Sculco.

Nationwide, surgeons have been offering younger patients bilateral knee replacement as concern for risk factors has grown. In a study published in 2012, Dr. Memtsoudis and colleagues analyzed a large national database of patients who had bilateral knee replacements between 1999 and 2008 to determine if outcomes changed over time. He found that while patients were younger in 2008, complications did not decline. This finding was surprising but explainable by the fact that patients were actually sicker in 2008 than they were a decade earlier, with higher rates of comorbidities. For example, obesity increased by 131 percent during the study period.

Dr. Memtsoudis sees this study as a wake-up call. "Before this study, we expected that patient complications were steadily decreasing after bilateral knee replacement because of an increased understanding of risk factors and improved medical care," he says. "Now we understand that the picture is more complex. We need to work on continuously improving management of patients with a variety of health issues."

Anesthesiologist and intensivist Stavros G. Memtsoudis, MD, PhD

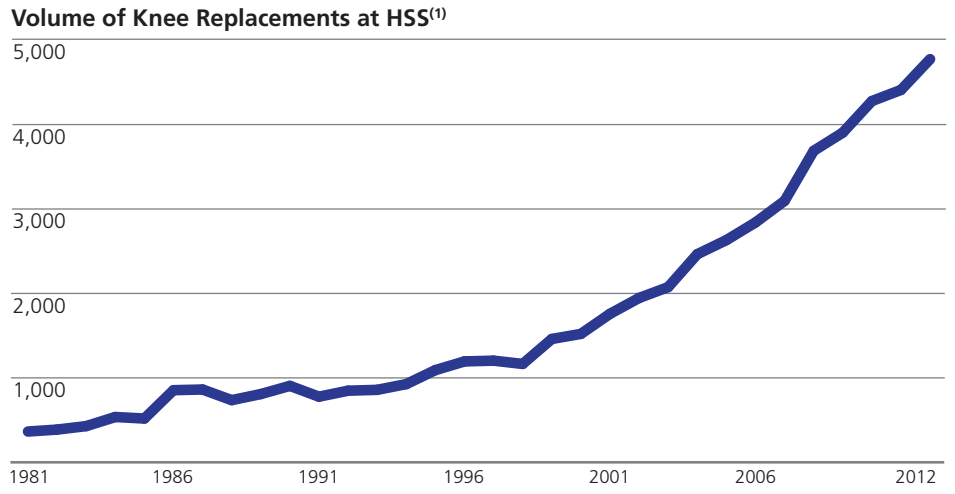
Preparing Patients for Recovery

At HSS, an interdisciplinary team of clinicians, researchers, and administrators works to fine-tune the "pathway of care" for knee replacement, from preoperative screening through rehabilitation. People who are healthy and prepared prior to surgery are more likely to succeed in rehabilitation following surgery and have better overall results.

Linda Russell, MD, a rheumatologist and director of the Perioperative Medicine Division, and orthopedic surgeon Charles Cornell, MD, have initiated a study of 100 knee replacement patients who have been identified as good candidates for a new program that includes increased health monitoring prior to surgery and an innovative step of a presurgical home visit by a physical therapist. The study will determine if this pre-care will increase the chances of patients successfully returning home with appropriate home-based and outpatient rehabilitation following surgery, as opposed to going to an inpatient rehabilitation facility.

"For many patients, going home and resuming normal life activities is their best option. The study will determine if receiving more support prior to surgery will result in a smooth transition home," says Dr. Russell.

Volume of Knee Replacements at HSS[1]



[1] *Includes totals, partials, and revisions. Bilaterals are counted as two.*

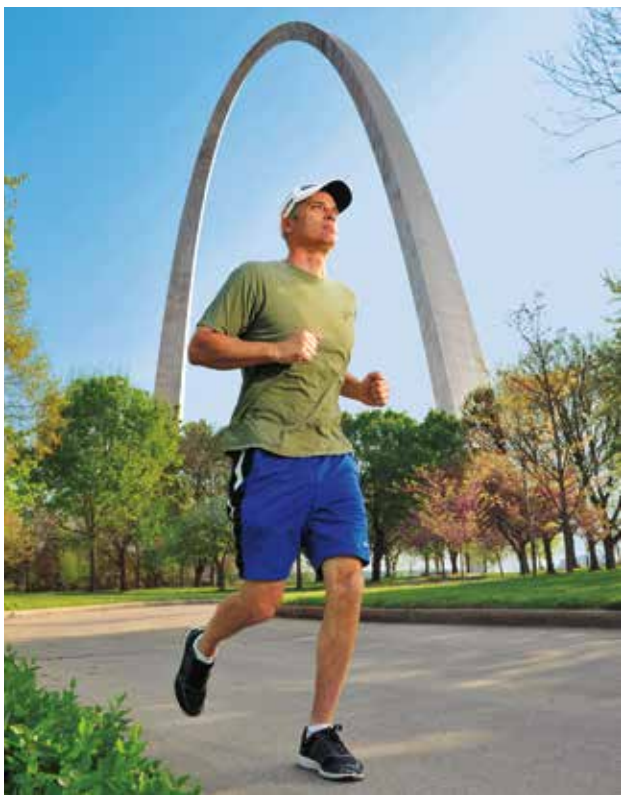
Evolving Treatment for Hip Injuries

The HSS Center for Hip Preservation was established in 2009 to lead the way in early diagnosis, management, and treatment of hip conditions. Among the first to offer a multidisciplinary approach to hip care, preservation, and treatment as well as education and research, the Center brings together a nationally recognized team of specialists committed to joint-preserving treatment options.

In addition to providing the most advanced nonsurgical and surgical care for patients, the Center's physicians and surgeons work hand-in-hand with scientists to design and implement registries and clinical trials to generate innovative approaches to diagnosis and treatment.

Hip Outcomes Registry

Registries allow us to track how patients do over time, helping our doctors to improve patient care. The Center for Hip Preservation Outcomes Registry was designed to capture and evaluate the outcomes of different types of treatment for non-arthritic hip pain – from non-operative to minimally invasive and open surgery – in patients under the age of 40. Established in 2010, the registry is currently tracking nearly 5,000 patients at regular intervals following treatment.



Eric Blume flew from Hawaii to HSS for arthroscopic hip surgery with Bryan T. Kelly, MD. Mr. Blume is now able to run pain-free in St. Louis, his current home.

Hip Impingement and Arthritis

One common cause of hip pain that is treated at HSS is femoroacetabular impingement (FAI), which occurs when the ball of the hip (head of the femur) does not have its full range of motion in the socket (acetabulum of the pelvis) due to excess bone. Using data obtained from the Outcomes Registry, specialists at the Center for Hip Preservation hope to shed light on the relationship between impingement and arthritis, and answer the questions: Does impingement lead to osteoarthritis of the hip? Does impingement surgery delay or prevent the development of arthritis?

The classic technique for treating impingement has been open surgery, in which a bony protrusion on the femoral head is rounded to improve its fit in the socket. Over the last 15 years, however, arthroscopic techniques have evolved, providing minimally invasive approaches to treatment.

"We're constantly trying to identify the best way to approach treatment for each individual patient, so that each will have the optimal outcome," says Bryan T. Kelly, MD, co-director with Ernest L. Sink, MD, of the Center for Hip Preservation and associate attending orthopedic surgeon at HSS. "The relationship between our ability to delay or prevent osteoarthritis through surgical intervention is really one of the primary goals of hip preservation. We're trying to preserve the hip rather than replace it, or at least delay the need for replacement," he adds.

Understanding Motion Limitations

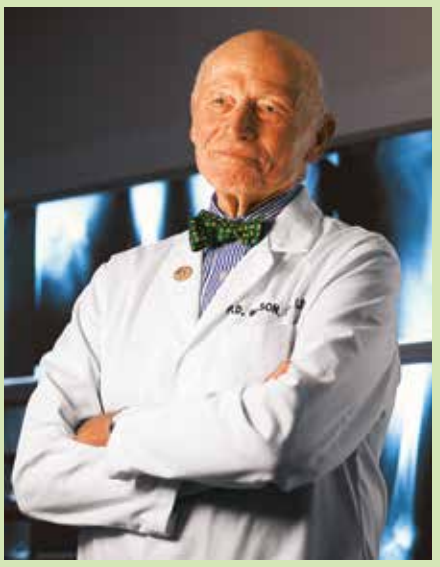
Dr. Kelly and his colleagues are also in the process of studying the gait difference between patients with FAI and those with normal anatomy as part of a clinical trial.

Bone friction caused by FAI can result in damage to the soft tissue that lines the hip socket, called the labrum, causing pain during common daily activities. It is unclear how the abnormal bone and soft tissue injury affect the muscles around the hip, and why this condition causes a change in walking patterns and movement. Patients enrolled in the study are tested at the Leon Root, MD, Motion Analysis Lab, where the movement of people with FAI is compared to that of those with normal hip anatomy.

This study will clarify how selected hip muscles contribute to different motions. Understanding the reason for motion limitations in patients with FAI will help HSS physician-scientists develop more effective nonsurgical treatments and post-operative rehabilitation plans for patients with hip pain.

Total Hip Replacement Surgery at HSS Then and Now

A Q&A with Philip D. Wilson, Jr., MD, surgeon-in-chief emeritus (1972-1989), about the evolution of the total hip replacement procedure at HSS.



Philip D. Wilson, Jr., MD

When did total hip replacement become a treatment option for patients at HSS?

Our interest really developed in the early 1960s, following reports of the pioneering work of Sir John Charnley in England. In 1965, I attended a biomechanics meeting in London where groundbreaking developments in ball and socket "total" hip replacement were presented and discussed. Charnley, one of the presenters, so impressed me with his work that I later returned for visits to his service, as well as other services in England and Europe. Meanwhile, Dr. Harlan C. Amstutz, who was leading HSS's biomechanics laboratory, had advanced his studies in hip replacement surgery to a point where we were able to begin the application of total hip implants in patients. We implanted the first one here in 1967.

How do total hip replacement patients fare today versus forty years ago?

In the early days, hospital stays were 10 to 14 days and recovery was measured in months. Today, patients go home in two to three days or less and start rehabilitation much sooner. They have much less pain and are able to resume an active lifestyle much earlier. This procedure has made a significant difference in the lives of patients.

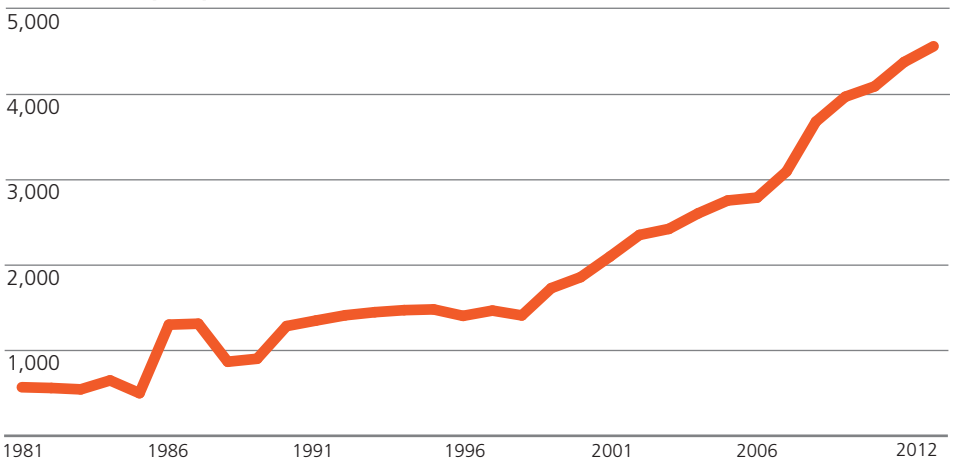
How have total hip patients changed over time?

Advances in anesthesia have permitted us to offer the surgery to younger patients with inflammatory disease, and older patients with osteoarthritis or hip degeneration related to aging. I'm proud of the fact that we've developed a safe environment for hip replacement at HSS, one that has enabled older patients to live more comfortably and younger patients to function better.

What does the future hold for total hip replacement?

I think we will continue to see improvements in basic material structure and implant design. Scientists, engineers, and surgeons continue to work on creating conditions that extend the durability and functionality of the artificial hip, including looking at ways of engineering devices that encourage bone to grow directly into the implant to reduce the risk of implant loosening and wear. ●

Volume of Hip Replacements at HSS[1]



[1] *Includes totals, partials, resurfaces and revisions. Bilaterals are counted as two.*

Future Promise for Patients

Through the study of appropriate treatment selection, techniques, and outcomes for patients with hip conditions, physician-researchers at the Center for Hip Preservation at HSS are making significant advances in care that will benefit HSS patients as well as others. "In the future," noted Dr. Kelly, "our collaborative research and clinical innovations will broaden the scope of care that can be provided to patients around the world." ●

Kudos

Elana Bernstein, MD, received a new two-year research grant from the Arthritis Foundation for "A Submaximal Stress Test to Identify Pulmonary Hypertension in Scleroderma."

Carl Blobel, MD, PhD, Virginia F. and William R. Salomon Chair in Musculoskeletal Research, and **Jane Salmon, MD**, organized a Basic and Translational Science Session for the European League Against Rheumatism meeting in Berlin.

Richard Bockman, MD, PhD, served on the Steering Committee for the Endocrine Society's 64th Clinical Endocrinology Update meeting, and lectured in the multi-city Endocrine Essentials Program for Endocrine Professionals.

Frank Cammisa, MD, Celeste Abjornson, PhD, and members of the Spine Research Lab won the Eastern Orthopedic Association Best Paper Award for "New Formulation of Demineralized Bone Matrix Putty Performs Substantially Equivalent to Iliac Bone Graft in Rabbit Posterolateral Lumbar Spine Arthrodesis."

Edward V. Craig, MD, MPH, received the Arthritis Foundation New York Chapter's Lifetime Achievement Award.

Mary K. Crow, MD, Benjamin M. Rosen Chair in Immunology and Inflammation Research, was named a Master of the American College of Rheumatology, one of the ACR's highest honors, and was appointed a member of the NIH Arthritis, Connective Tissue and Skin study section for 2012-2016.

Edward DiCarlo, MD, received an Award for Teaching Excellence for his participation in the Basis of Disease Course at Weill Cornell Medical College.

Joshua S. Dines, MD, David W. Altchek, MD, James Andrews, Neal ElAttrache, Kevin Wilk, and Lewis Yocum edited the book, *Sports Medicine of Baseball*. **Joshua S. Dines, MD, David W. Altchek, MD, Rock Positano, DPM, MSc, MPH**, and Christopher DiGiovanni edited the book, *Foot and Ankle Sports Medicine*.

Doruk Erkan, MD, was an Organizer of the 2nd APS ACTION Working Meeting in Berlin.

Mary Goldring, PhD, Ira W. DeCamp Fellow, was an invited speaker at the 7th International Congress of the Chinese Orthopaedic Association in Beijing and a visiting professor at Xi'an Jiatong Medical School in Xi'an, China.

Steven Goldring, MD, Richard L. Menschel Research Chair, was an invited speaker at the International Congress on Spondyloarthropathy in Gent, Belgium and a visiting professor at the University of Nebraska Medical School in Omaha. Along with **Dr. Mary Goldring**, he served on a panel that conducted site visits in the U.K. to review applications for Arthritis Research-United Kingdom.

Jo Hannafin, MD, PhD, was Guest Lecturer at the Tria Orthopaedic Center/University of Minnesota Sports Medicine Conference; named President-Elect of the American Orthopaedic Society for Sports Medicine; and elected Secretary of the Herodicus Society.

Xiaoyu Hu, MD, PhD, Sinead Smith, PhD, Baohong Zhao, PhD, Carl Blobel, MD, PhD, and **Lionel Ivashkiv, MD**, published "Notch-RBP-J Signaling Regulates the Transcription Factor IRF8 to Promote Inflammatory Macrophage Polarization" in *Nature Immunology*. The article was highlighted by *TIME Magazine*.

Lionel Ivashkiv, MD, David H. Koch Chair for Arthritis and Tissue Degeneration Research, received a five-year renewal grant from NIH/National Institute of Dental and Craniofacial Research (NIDCR) to study "Negative Regulation of Human Osteoclastogenesis."

Michael Lockshin, MD, received the National Leadership Award for Lupus Medical Advancement from the Lupus Foundation of America.

Carol Mancuso, MD, reviewed Research Career Development Award proposals for the National Heart, Lung, and Blood Institute (NHLBI).

Lisa Mandl, MD, Charles L. Christian Research Fellow, received a new one-year National Psoriasis Foundation Discovery Grant for "Joint Replacement Outcomes in Psoriatic Arthritis."

Robert Marx, MD, has been appointed Deputy Editor, Evidence-Based Orthopedics, *Journal of Bone and Joint Surgery* and was a visiting professor at the University of Manitoba.

Helene Pavlov, MD, received the Alumni Achievement Award from Temple University School of Medicine.

Yu Qiao, PhD, received a new two-year grant from the Arthritis Foundation.

Scott Rodeo, MD, received a two-year award from NFL Charities to study "Use of Platelet Rich Plasma and Bone Marrow Derived Stem Cells for Tendon Degeneration"; and a three-year award from American Orthopaedic Society for Sports Medicine in collaboration with **Suzanne Maher, PhD, Matt Koff, PhD, Hollis Potter, MD**, and **Russell Warren, MD**, to study "Meniscus Allograft Transplantation: Quantifiable Predictors of Outcome." Dr. Rodeo, along with Carolyn M. Hettrich, MD, Selom Gasinu, Brandon S. Beamer, **Mark Stasiak**, Patrick Birmingham, **Alice Fox, Xiang-Hua Deng, MD**, and **Olivia Ying**, received the Cabaud Memorial Award from the AOSSM. Dr. Rodeo also served on an NIH Study Section to review proposals on Skeletal Biology Structure and Regeneration.

Patrick Ross, PhD, received a new four-year research grant from NIH/NIAMS in collaboration with the University of Florida to study "Regulator of Calcineurin (*RCAN1*) – A Novel Regulator of Osteoclastogenesis."

Sergei Rudchenko, PhD, received a new two-year research grant from NIH/National Institute of Biomedical Imaging and Bioengineering (NIBIB) in collaboration with Columbia University to study "Isolations of Narrow Subpopulations of Cells Using Molecular Computing Cascades."

Jane Salmon, MD, Colette Kean Research Chair, in collaboration with **Alessandra Pernis, MD**, Peter Jay Sharp Chair in Lupus Research, received a new two-year Exploratory/Developmental Research Grant from NIH/National Institute of Arthritis and Musculoskeletal and Skin Disease (NIAMS) to study "Inhibition of ROCK to Reverse T Cell Dysfunction in SLE." Dr. Salmon also was elected as the Henry Kunkel Society Council member for the 2012-2015 term; was the Annual Ogryzlo Research Day Visiting Professor at the University of Toronto, Division of Rheumatology; and presented the Nanna Svartz lecture at the annual meeting of the Swedish Society of Medicine.

Andrew Sama, MD, received a new one-year OREF Fellowship Grant in Spine Care.

Peter Torzilli, PhD, served as a member of an NIH Special Emphasis Panel reviewing R01 and R21 grants.

Scott Wolfe, MD, completed a two-year term as Secretary of the New York Society for Surgery of the Hand and is now Vice President of the Society for 2012-13; was Guest Professor at SUNY Downstate; and was an Invited Guest Lecturer at Northwestern University Department of Orthopedics.

Timothy Wright, PhD, F.M. Kirby Chair in Orthopaedic Biomechanics, was selected as the 2013 recipient of the Alfred R. Shands, Jr., MD Award by the Orthopedic Research Society. This award recognizes contributions to orthopedics and the devotion of a significant portion of a professional lifetime to furthering knowledge in the field of musculoskeletal disease. Dr. Wright, **Thomas Sculco, MD, Douglas Padgett, MD, Mathias Bostrom, MD, Edwin Su, MD**, and **Joseph Lipman, MS**, also attended the 7th International Congress of the Chinese Orthopaedic Association in Beijing, where they presented a course on "The HSS Experience in Hip Arthroplasty."

Baohong Zhao, PhD, was invited as a keynote seminar speaker at Saitama Medical University, Research Center for Genomic Medicine, Japan, and was an invited speaker at Showa University, Tokyo.

Find us on Facebook.

Follow us on Twitter.

Watch us on YouTube.

Download our app.

Read our blog at www.hssonthemove.com

Visit us at www.hss.edu.

The Osteoarthritis Initiative: The Power and Potential of Interdisciplinary Research continued from page 2

that allow articular and fibrocartilage to withstand applied force, called "load." "If you jump from a height onto a flexed knee, such as in a rebound in basketball, you are loading the cartilage in that knee," explains Dr. Potter. "Having insight into the ultrastructure of the cartilage is essential in diagnosing OA resulting from trauma or a predisposition to early OA. These imaging techniques also allow us to evaluate the health of the cartilage following surgical repair without performing a surgical biopsy."

Exploring Novel Materials for OA Treatment

As a clinician-scientist, Scott A. Rodeo, MD, co-chief of the Sports Medicine and Shoulder Service, repairs his patients' soft tissue injuries. He then takes the challenges he faces in the clinical setting into his basic science laboratory, where he and his colleagues investigate the biology of cartilage.

In one such project, they are evaluating lubricin, an important molecule produced in the joint by cells on the surface of cartilage. "Lubricin adds lubricating capacity to normal joints, helping to reduce wear on cartilage," says Dr. Rodeo. "In arthritis, this material is often deficient."

Dr. Rodeo's lab is collaborating with the Department of Biomedical Engineering at Cornell University to study synthetic materials that are lubricin-like, with the hope that they will help reduce wear on cartilage. If successful, the potential exists for developing a simple, injectable therapy that could help delay the onset of OA.

Poised to Transform OA Treatment

"Public health data indicate that the prevalence, impact, and economic consequences of osteoarthritis are expected to rise dramatically over the next several decades," says Steven R. Goldring, MD, chief scientific officer and the Richard L. Menschel Research Chair. "HSS provides a wonderful interactive environment in which dialogues between scientists and physicians help to define the major clinical problems associated with OA and how research can address them."

Editorial Committee: Deborah Sale, Shelley Rosenstock

Director of Marketing: Rachel Sheehan

Editor-in-Chief: Beth Demel

Contributing Writers: Teresa Lamb, Linda Errante

Design: Arnold Saks Associates

Major Photography: Robert Essel

Other Photography: Jim Barber, Robert Glick

Printing: Monroe Litho

Discovery to Recovery is published twice a year by the External Affairs Department, Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021. 866.976.1196 d2r@hss.edu, www.hss.edu/d2r

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