2011-2012 Chief's Report Massachusetts General Hospital

Harry E. Rubash, M.D.

As I write my 2012 Chief's report, I am astounded at the rate by which changes in the health care profession continue to occur. In the aftermath of the mid-term elections and the change in the balance of power in Washington, I felt optimistic. I hoped we could create a health care system that preserves attributes of the Patient Protection and Affordability Care Act while providing an affordable health care program – one that integrates prevention, wellness, public health and the sophisticated care we are accustomed to delivering in our academic medical centers.

Since then, much has happened. The US Supreme Court has ruled in favor of the Act. In an attempt to bend the curve of health care spending at the state level, our Governor recently signed an even more regulatory Massachusetts Cost Containment Bill. Under this new state law our academic medical centers and other medical institutions will be required to report to the state our financial performance, price trends, market trends, market share, and a variety of other metrics soon to be determined. An 11-member Health Policy Commission will use this information to enforce regulatory rules to ensure that growth of health care spending is no more than 0.5 percentage points lower than gross state product (which, at this point, no one knows how to define). I worry that the Commission will try to control the practice and organization of medicine in such a broad and deep way where the outcome is far from predictable. As we all anxiously await further information about this comprehensive bill, the leadership within our institutions and Partners are closely monitoring the situation. Now more than ever, your involvement in the political process is needed.

Accountable Care Organizations

In December 2011, the Center for Medicare and Medicaid Services (CMS) notified Partners Healthcare that it was selected as a pioneer Accountable Care Organization (ACO) model. Sponsored by CMS, this innovative and untested federal program aims to transform the delivery of health care. It provides Medicare patients with high quality care, while simultaneously slowing cost growth through an enhanced Care Coordination Program. ACOs seek to avoid the old HMO models by having all of the providers jointly at risk for the care of the patient.

In late December of 2011, our patients (more than 45,000) were notified that their primary care physicians were participating in a new Care Coordination Program. We are now approximately nine months into the program and awaiting the first set of metrics on expenditures. As orthopaedic surgeons, we can take a leadership role by coordinating orthopaedic care among the specialist, the PCP and other providers (see Arthroplasty Care Redesign). This important communication between specialists and referring physicians will increase in significance as more fiscal pressure is applied from CMS.

For some common orthopaedic procedures the actual payment mechanisms involved in the ACO will move us from a fee-for-service to a more bundled payment. By avoiding complications (reoperations, readmissions), our ACOs can anticipate cost-savings, which will theoretically be passed along to the physicians.

The efforts in the pioneer ACO are paralleled by new at-risk contracts with our commercial insurers. In the latter circumstance,

as specialists we will be charged to continue implementing enhanced low-cost access to the most efficient and highest quality specialty services possible. While the risk pool from the big three payors is relatively modest at this point (1.25%), the dollars at risk are substantial.

The pioneer ACO is the second CMS innovation project at the MGH. The first was a care management program–one of only 26 nationwide–to develop new strategies to improve delivery of health care at a reduced cost to the most vulnerable, high-risk patients in a Medicare population. The MGH program was successful, while many others were not.

These new reimbursement paradigms are substantial and real, and will have an enormous impact on us in the future. The infrastructure costs, full definition of the metrics, as well as the investment in population management will hopefully lead to sustained cost reduction trends in the future. I will update you on the outcome in next year's report.

MGH Bicentennial

On August 20, 1810, Drs. James Jackson and John Collins Warren circulated a petition calling for the founding of a hospital. Their appeal to the community for supportive funds was crafted to entice empathy and compassion. Today these words continue to guide our mission to care for patients and to make strides in the world of medical health care. I encourage you all to read the new book detailing the hospital's history up to the present, Something in the Ether: A Bicentennial History of Massachusetts General Hospital, 1811-2011 by local author Webster Bull and his daughter Martha Bull. This book commemorates the 200 years of medicine, service and innovation fostered by the MGH, our nation's third oldest general hospital. I am pleased to have shared in the numerous innovations that have taken place in our Department, thanks to the diligence and perseverance of our eminent former colleagues and current members of our Department.

US New & World Report

On a very warm July 17th, with a beautiful blue sky in Boston, the sense of pride was palpable in the Bulfinch tent as hospital employees, public officials, and the news media gathered for an enormous celebration. The MGH was ranked #1 in the nation on the US News & World Report's Best Hospitals list. The MGH replaced Johns Hopkins Hospital, which had been at the top of this list for 21 consecutive years. The standing-room-only event was attended by Dr. Peter Slavin, President of the MGH, Dr. David Torchiana, Chairman and CEO of the MGPO, Dr. Jeffery Flier, Dean of the Harvard Medical School, Dr. Gary Gottlieb, President and CEO of Partners Healthcare, and our own Mayor, the Honorable Thomas M. Menino. The Mayor announced that July 17th will officially be known as MGH's #1 Day in the city of Boston and stated, "When Boston is at its best in something, we bring out the Duck Boats!" Cheers erupted from the crowd as the amphibious landing vehicle pulled into the Wang Ambulatory area and spewed confetti into the air. This event was for all who diligently and tirelessly make a difference in the lives of other human beings on a daily basis. I have never been at an institution that spends as much time and effort on the highly individualized care of each patient. It is our honor to be affiliated with this fine institution. The MGH was also recognized among top US hospitals in each of the 16 specialties, including orthopaedics. Well done and congratulations to all!

Campaign for the Third Century of MGH Medicine

Two years ago the MGH launched the largest fundraising campaign in its 200-year history. The three-year effort to raise 1.5 billion dollars, called the "Campaign for the Third Century of MGH Medicine," will create funds necessary to enable the MGH and our physicians to continue to deliver the highest quality care, conduct pioneering biomedical research, address pressing

health care needs locally and globally, and educate the caregivers of tomorrow. Our Department has adopted the motto, "You don't have to be a patient at the MGH to be cared for by the MGH." This lofty goal is demonstrated by the numerous translational activities that go on within the Department and have reached patients globally. These include new techniques for total hip arthroplasty after acetabular fracture, improved methodologies for ligament reconstruction of the knee, a better understanding of the kinematics of the lumbar spine and spine disc replacements, generations of new polymers to decrease wear in total hip and total knee arthroplasty, innovative new knee designs, and the list goes on and on!

One important part of the campaign was the opening of the Lunder Building. Peter and Paula Lunder of Maine donated $35 million toward the building and received naming rights to the wonderful new tower. This new state-of-the-art facility houses Radiation Oncology, Radiology, inpatient and outpatient surgery (including Orthopaedic Surgery) and a cutting-edge surgical center with new operating rooms. The top five floors offer increased inpatient capacity for Cancer, Neurology and Neurosurgery. The Orthopaedic operating rooms are located on the third floor and have undertaken an aggressive campaign–called the Orthopaedic Innovation Project–to increase the quality, safety and efficiency of care for our patients.

Orthopaedic Innovation Project

Last summer, a senior leadership team including Jeanette Ives Erickson, RN, DNP, Greg Pauly, Ann Prestipino, Jeanine Wiener-Kronish, MD, and I, came together to launch the Orthopaedic Innovation Project. The goal of this project is to build a culture and perioperative system supporting the motto of the new Lunder 3 operating rooms, "Great Care,On Time, Every Time." The senior leadership team charged Wilton Levine, MD, Director of Compliance, Regulatory Affairs and Disaster Management, Department of Anesthesia, Critical Care and Pain Medicine, to lead this effort along with Mark Vrahas, MD, Chief of Partners Trauma Service, Eddie Belmar, Orthopedic Equipment and Instrument Coordinator, Jim Barone, RN, Clinical Nurse Manager, Main Orthopaedic Operating Rooms, Lauren Lebrun, Administrative Fellow, and Robert Peloquin, MD, Division Chief of Orthopaedic Anesthesia. The team is responsible for managing daily operations on Lunder 3 as well as associated improvement initiatives. The strongest element of this project has been team engagement, both at the senior leadership level and at the front-line staff level. A testament to this engagement was the 140-person attendance at the multidisciplinary perioperative retreat in July 2012, held at the Liberty Hotel and hosted by OIP operational leaders.

Currently, the team, together with Lunder 3 staff, has implemented a successful "on-time start" initiative resulting in a 20% average increase in the number of first cases starting on time. Additional improvement efforts have centered on decreasing room turnover times, leading to an overall 15% decrease. To facilitate further OR efficiencies, the team is currently working on streamlining pre-surgical patient preparation processes. Our orthopaedic surgical volume is increasing and our efficiency metrics continue to improve. Although this work is still in its infancy, I am enthused by our progress to-date.

Arthroplasty Care Redesign

In early 2011, hospital and physician leadership launched an institutional-based Care Redesign initiative that is similar to an effort underway at Partners. The MGH/MGPO-based Care Redesign Program focuses on reengineering care delivery for specific patient diseases or episodes of care in an effort to improve patient care and in preparation for payment reform, to make it more affordable. One of the areas of focus is total joint replacement procedures.

Leading the Total Joint Replacement Redesign effort is Andrew Freiberg, MD, Vice Chair, Department of Orthopaedic Surgery, Robert Peloquin, MD, Division Chief of Orthopaedic Anesthesia, Greg Pauly, Chief Operating Officer of the MGPO, and a large clinical and administrative team. Following months of research and small-scale pilot programs, the team launched the Total Joint Replacement "EXCELerated Recovery Program" in March 2012. The program employs elements of enhanced patient education, early mobilization and medical management changes and focuses on decreasing average patient length of stay. To date, this program has resulted in a significant decrease in PACU time and a 20% decrease in average patient length of stay. Our patients report that the care offered through the program is patient-centered and highly coordinated. Congratulations and well done!

Carole Mankin

Carole J. Mankin (née Pinkney), age 81, of Brookline, passed away on Saturday, September 8, 2012. For sixty years, she was the beloved wife of Dr. Henry Mankin and the loving mother of Allison Mankin and her husband Jim Carton, David Mankin, and Keith Mankin and his wife Julia Fielding. Carole was a gifted medical librarian and was in charge of special projects at Massachusetts General Treadwell Library. Dr. Mankin shared a poem with me that he wrote for his wife, which I would like to share with all of you:

A SAD, SAD, SAD POEM ABOUT MY POOR ANGEL CAROLE'S DEATH

Most of the people who will read this poem will know the story of the sad event
Carole was 81 and was my wife of 60 years and has been recently to heaven sent
She was an angel and a princess and a warm and loving mother and wife
And had a beautiful, adoring, very productive and intellectual life.

Three years ago she was discovered to have a tumor of her brain
Oddly enough she never had any early symptoms or head pain
She was given profound chemotherapy and effective radiation
And the tumor disappeared on MRIs in a fairly short duration…

And then with sadness and regret, we watched it all begin to go downhill
She had more trouble sleeping and had to take many and many a pill…
They tried to help her with all kinds of systems and devices very wide
But ultimately she failed to maintain her heart function and she died…

We viewed sweet Carole in her casket at Levine Chapel on Harvard Street
And she was buried at Sharon Memorial Cemetery in a ceremony very neat
Lots of children, cousins and friends came to our house for a brief show of love
To honor a wonderful woman, mother, wife and friend who is in heaven above.

Dr. Mankin noted that if anyone would like to make a donation to the MGH in Carole's memory, he personally would be honored to have those donations go to the Henry J. Mankin, MD, Professorship in Orthopaedic Surgery. Your donation will honor Dr. Mankin's legacy in perpetuity, ensuring that generations of young surgeons will be taught by our clinicians and scientists who exemplify Dr. Mankin's intellect, energy and most importantly, his empathy. Please contact Bob O'Brien in the Development office at 617-726-0991 or rhobrien@partners.org

The Michael Clarke Family Memorial Fund

It is with great sadness that I announce the passing of Dr. Michael Clarke, a graduate of the 2011 Sports Medicine Fellowship. Michael was a Lt. Commander (Commander Select) of the U.S. Navy, husband of Rebecca Miller-Clarke and father of their three young children. He died suddenly on Wednesday, December 28, 2011, in Beaufort Memorial Hospital, Beaufort, SC. Michael was an honors graduate of Emmaus High School in Emmaus, PA, and an honors graduate of the U.S. Naval Academy at Annapolis, MD and the Uniformed Services University of the Health Sciences School of Medicine in Bethesda, MD. He was a Naval Flight Surgeon and a Board Certified Orthopaedic Surgeon stationed at the United States Naval Hospital in Beaufort, SC. He is the son of Patricia and Leo George Clarke III, and the brother of Jennifer Clarke-Sirignano. The family requests that donations be made to the USO (United Service Organizations), P. O. Box 96322, Washington, DC 20090-6322 or www.uso.org/donate or to a scholarship fund for the children.

New Faculty Updates

Thomas Cha, MD, MBA

It is a great pleasure to welcome Thomas Cha, MD, MBA, to the Department of Orthopaedic Surgery at Massachusetts General Hospital. Dr. Cha is an Assistant in Orthopaedic Surgery at the MGH and Instructor in Orthopaedic Surgery at Harvard Medical School. He received his medical degree from Drexel University College of Medicine in Philadelphia and finished his orthopaedic residency at New York Presbyterian Hospital – Columbia. After an outstanding fellowship in spine surgery at Rush University Medical Center, he returns to the MGH with a distinct interest in degenerative spine conditions, cervical spine disorders, myelopathy and spinal stenosis. Dr. Cha will use his Masters in Business Administration to continue his interests in health care quality and outcomes after spinal surgery. His specific expertise includes an interest in minimally invasive spine surgery, decompression and spinal fusions, as well as motion sparing procedures. Dr. Wood, Chief of the Spine Service, says "Dr. Cha brings a new and exciting perspective to the Division of Spine Surgery. With a Masters Degree in Business Administration, Dr. Cha has already begun meaningful research into the cost and utility of much of our decision making in Spine surgery. In addition, he has focused his clinical and laboratory attention on the cervical spine with an emphasis on techniques aimed at preserving motion and function in the least invasive manner possible." We look forward to Dr. Cha's many contributions to the Department. Please join me in welcoming him and his wife Janet to the Spine Service.

Jeffrey Kreher, MD, FAAP

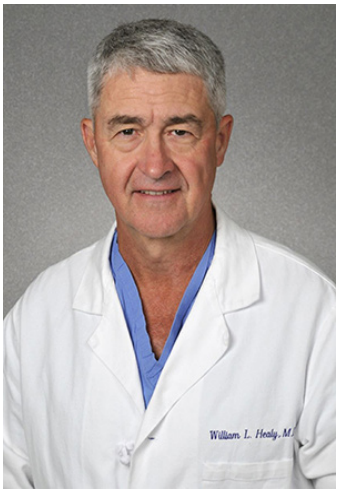
It is a great pleasure to welcome Jeffrey B. Kreher, MD, FAAP, to the Pediatric Service in the Orthopaedic Department. Dr. Kreher completed his medical training at the University of Missouri – Columbia School of Medicine, after a successful career in the U.S. Air Force Academy. He completed his residency in Internal Medicine and Pedi-

atrics at Indiana University, followed by a Primary Care Sports Medicine fellowship at Boston University Medical Center. His interests include pain in the throwing athlete, football injuries, as well as a variety of other sports-related conditions in the pediatric and young adult population, which makes him an outstanding addition to the service. He will be working closely with Dr. Maurice Albright, Dr. Gleeson Rebello and Dr. Brian Grottkau as they create a comprehensive network of Pediatric Orthopaedics in the surrounding area. Please join me in welcoming Dr. Kreher. Dr. Grottkau, Chief of the Pediatric Orthopaedic Service, says "Dr. Kreher adds a unique non-operative perspective to our practice of pediatric orthopaedics. The majority of the patients we see in our office have conditions that require evaluation but not surgery. Dr. Kreher has outstanding training and experience in musculoskeletal medicine. Because of his training as a pediatrician and interist, he also relates well to our primary care referral base."

William Healy, MD

The Department of Orthopaedic Surgery is pleased to welcome William L. Healy, MD, to our staff at the MGH and NWH. Dr. Healy joins us after a highly successful career at Lahey Clinic, where he has practiced for 28 years, serving as Chairman for 22 years. Dr. Healy is a world-renowned orthopaedic surgeon who has developed expertise in Adult Reconstructive Orthopaedic Surgery and he is a member of the Hip Society and the Knee Society. Dr. Healy will practice and teach primarily at the MGH Newton-Wellesley Joint Center starting on January 1, 2013.

Dr. Healy was educated at Needham High School, Amherst College, and S.U.N.Y. Downstate Medical Center. He graduated from the Orthopaedic Surgery Resident Training Program at Johns Hopkins Hospital, where he served on the faculty before returning home to Boston.



Dr. Healy and his wife Angela C. Healy, MD, live in Concord, MA, where they have raised five children. He is an avid golfer and a loyal fan of the Boston Red Sox. We welcome Dr. Healy to our faculty. He is a gentleman, a scholar, an academic leader, a gifted surgeon and a good friend!

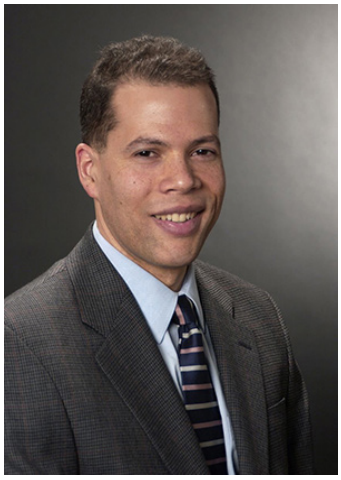
Musculoskeletal Genetics and Regenerative Biology Laboratory

We also welcome Jenna Galloway, PhD, to the Orthopaedic Research Laboratories. Dr. Galloway received her PhD in Genetics from Harvard University. Her graduate research, performed in the laboratory of Dr. Leonard Zon, focused on the genetic pathways regulating blood stem cell and progenitor cell biology. These studies resulted in several publications, and laid the groundwork for her interests in stem cell biology and zebrafish genetics. After receiving her PhD, Dr. Galloway became a postdoctoral fellow with Dr. Clifford Tabin in the Genetics Department at Harvard Medical School, where she studied musculoskeletal development. Her early research in this field led to a molecular understanding of the mechanisms under-

lying phocomelia, a specific type of congenital limb abnormality; this work was published in the journal Nature. She subsequently established the zebrafish as a model system in which to study tendon development and regeneration. Her new laboratory will use zebrafish genetics and stem cells to understand how tendons and ligaments form, organize and repair, with the ultimate goal of applying this knowledge toward the development of improved therapies for tendon and ligament injuries. We look forward to her many scientific contributions and welcome her to the MGH.

New HCORP Program Director and Program Coordinator

It is a great pleasure to announce that after an exhaustive national search, the HCORP Executive Committee selected Dr. George Dyer, Instructor in Orthopaedic Surgery at HMS and outstanding hand surgeon at the Brigham and Women's Hospital, as our new Program Director for the Combined Harvard Orthopaedic Residency Program.



Dr. Dyer trained at Harvard and completed an upper extremity fellowship at Brigham and Women's Hospital, Children's Hospital and the MGH. His clinical interest is in trauma and post-traumatic reconstruction of the upper extremity. As Residency Program Director, he looks forward to helping Harvard lead the way toward improving orthopaedic surgical training, to make it safer for patients, more effective for trainees, and more fun for everybody.

I recently led the search for a new Harvard Combined Orthopaedic Residency Coordinator and am pleased to report that Jennifer Duane assumed that position and joined us in June. Jennifer comes to us from Boston Children's Hospital, where she worked for the past ten years as the Program Coordinator and later the Program Administrator for the Harvard Medical School Joint Program in Nuclear Medicine. Because her previous experience was with a multi-institutional program sponsored by Brigham and Women's Hospital, Jennifer is already very familiar with the accreditation process and the Partners GME community. Jennifer earned a Bachelors degree in Psychology from Boston College. Her work in the GME field inspired her to pursue a Masters of Education at Boston University, concentrating in Higher Education Administration. She is excited about working with all 62 of the HCORP residents and the upcoming recruitment season. Jennifer also looks forward to working with Dr. Dyer, the new HCORP Program Director, and other members of the HCORP faculty on implementing new educational initiatives, as well as preparing the program for the ACGME's Next Accreditation System (NAS).

This year, Diane Sheehan, who served as the Harvard Combined Orthopaedic Residency Coordinator for 14 years, assumed the position of Senior Accreditation Manager in the Graduate Medical Education Office at MGH. Diane first started working in Orthopaedics in 1974 when Dr. John Hall at Children's Hospital hired her as his medical secretary. She left that position in 1981 and spent the next decade as a stay-at-home mom. From 1991 until 1998, Diane worked at Brigham and Women's Hospital for Dr. Barry Simmons as his administrative assistant and Hand Fellowship Coordinator. In June 1998,

Diane was recruited to become the Orthopaedic Residency Coordinator for Dr. James Herndon, Program Director, until he retired in 2000. Diane finished her Orthopaedic career during the Program Directorship of Dr. Dempsey Springfield.

Diane lives with her husband, Gary, in Norwood and has three adult children, Michael, Patricia, and Kenneth. We will miss her at HCORP!

Annual Department of Orthopaedic Surgery Retreat

This year's annual retreat was held at the beautiful Seaport Hotel in downtown Boston. The program included deliberations on a variety of important strategic options as well as the creation of an updated strategic plan for the Department. We are now placing a new emphasis on value-based orthopaedic surgery.

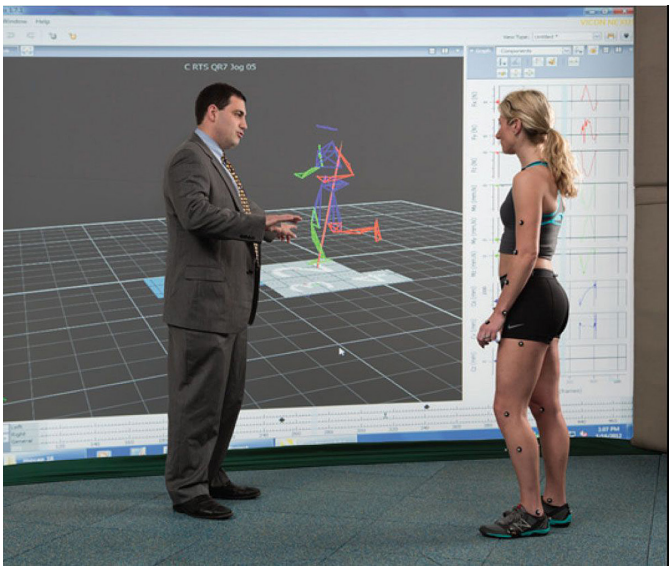
The highlight of the retreat was a roundtable discussion, "Update on Healthcare Reform." Mary L. Witkowski, MBA, gave a keynote address on "Value Driven Healthcare." She was joined in our roundtable discussion by Aimee Golbitz, Manager of Federal Affairs and Policy at Partners ("Status of State and Federal Healthcare Reform Efforts") and Gregory Pauly, the MGPO Chief Operating Officer ("What a PO Practice Should be Doing to Prepare for Healthcare Reform"). This year we added a new feature to the retreat, our first successful Poster Session! Clinical faculty and departmental research groups were invited to participate and present an overview of their activities. The event was well received and showcased the diversity of basic, translational, and clinical investigation for which the Department is well-recognized. The poster session also provided an important forum for the exchange of ideas and discussions of new projects and served to outline the capabilities, interests and expertise of all our members. A warm thanks to all who participated and made this event a success.

Brigham and Women's/Mass General Healthcare Center at Foxborough

The Brigham and Women's/Mass General Health Care Center at Foxborough exists as a partnership between Mass General Hospital and Brigham and Women's Hospital, and provides full service outpatient medical care. Located next to Gillette Stadium at Patriot Place, this 1.3 million-square-foot development is a four-story center with multi-specialty physician offices, an urgent care center, advanced diagnostic imaging, rehabilitation services, and four operating rooms for outpatient surgery.

Orthopaedics continues to drive the success of the Health Care Center. A growing number of our surgeons and physiatrists are seeing patients at this facility including: Drs. Eric Berkson (Sports Medicine), Thomas Gill IV (Sports Medicine), Jennifer Kurz (Physical Medicine and Rehabilitation), Kelly McInnis (Physical Medicine and Rehabilitation), Rosalyn Nguyen (Physical Medicine and Rehabilitation), Luke Oh (Elbow), Gleeson Rebello (Pediatric Orthopaedics), and Joseph Schwab (Oncology, Spine).

The Brigham and Women's/Mass General Health Care Center is home to the Mass General Orthopaedics Sports Performance Center (www.MassGeneralSportsPerformance.org) and the Mass General High School Sports Clinic, which provides no-charge physician visits to in-season high school athletes during their fall sports.



The Mass General Orthopaedics Sports Performance Center

In April 2012, the Mass General Orthopaedics Sports Performance Center opened to the public, offering individualized analyses and supervised custom fitness programs designed to maximize recovery from injury, prevent injuries and enhance and optimize physical performance. The Center integrates state-of-the-art technology with the clinical expertise of Mass General Sports Medicine physicians, certified athletic trainers, biomechanical engineers, therapists, cardiologists, nutritionists and certified strength and conditioning coaches to critically and scientifically analyze athletic activities and develop individualized exercise and fitness programs.

Under the leadership of Director Eric Berkson, MD, and Clinical and Research Director Donna Scarborough, PT, the Mass General Orthopaedics Sports Performance Center serves athletes of all ages and levels, specializing in baseball (Clinical Leaders Sam Horn and Matt Kramer), running (Clinical Leader David Nolan, PT, DPT, MS, OCS, CSCS), and golf (Clinical Leaders Kyle Rodenhi, PT, MS, OCS, and Doug Perron, PTA).

The Mass General/ North Shore Center for Outpatient Care

The Mass General/North Shore Center for Outpatient Care in Danvers celebrated its third anniversary in May. Conceived and constructed as a joint effort with the North Shore Medical Center, this facility is located on Endicott Street in Danvers, just off Rt. 128, and includes both an 80,000-square-foot medical office building and a 125,000-square-foot ambulatory surgery care center. Dr. Brian Grottkau, Chief of Pediatric Orthopaedics, is the Medical Director of the Orthopaedic Program in this facility. Other Orthopaedic Surgeons and Orthopaedic Medicine Specialists seeing patients at The Mass General/North Shore Center for Outpatient Care include: Drs. Gleeson Rebello (Pediatric Orthopaedics), Francis Hornicek (Orthopaedic Oncology), A. Holly Johnson (Foot and Ankle), Saechin Kim (Pediatric Orthopaedics, Pediatric Spine), and Jeff Kreher (Pediatrics Sports Medicine, General Pediatrics). At this facility our surgeons offer care in the areas of Pediatric Orthopaedics, Hand and Upper Extremity, Orthopaedic Spine, Orthopaedic Oncology, and Foot and Ankle.

Newton-Wellsley/ Massachusetts General Hospital Orthopaedic Service Collaborations

The Jim and Ellen Kaplan Center for Joint Reconstruction Surgery at Newton Wellesley Hospital (NWH) continues to grow and evolve under the leadership of its director Dr. Joseph McCarthy, Vice Chairman and Chief of Reconstructive Joint Surgery at Newton-Wellesley Hospital. Dr. McCarthy was the host of the International Society of Hip Arthroscopy's Annual Meeting, which was be held in Boston in September 2012.

He is joined at NWH by Dr. Hany Bedair of the Arthroplasty Service and Dr. Holly Johnson of the Foot and Ankle Service, who will soon be seeing patients in the Joint Center. In January 2013, Dr. William Healy will be joining the Kaplan Center. Dr. Healy is an arthroplasty surgeon and we are

very pleased to have him in our growing network of physicians. He will be part of the Arthroplasty Fellowship and teaching service at MGH and NWH.

In the fall of 2012, an additional operating room will be opened at NWH, specifically for total joint surgery. Further surgical procedure growth will also occur with the opening of the Ambulatory Surgical Center in Wellesley, located close to Newton-Wellesley Hospital. A number of Newton Wellesley surgeons will be performing surgery at this new facility.

In the spring of 2012, Newton-Wellesley formalized the Department of Orthopedics under the direction of Dr. Timothy Foster. Dr. Foster received his medical degree from Boston University School of Medicine, and trained at Dartmouth-Hitchcock Medical Center in general surgery and the Boston University/Lahey Clinic Orthopaedic Surgery Program. Dr. Foster completed a fellowship at the Mass General Hospital in Adult Sports Medicine and he completed a fellowship in pediatric and adolescent sports medicine at Children's Hospital in Boston. He was formerly an Associate Professor of Orthopaedic Surgery at Boston University and part of the Academic faculty at University Hospital and Boston Medical Center. He has been the team physician for Boston University sports for the past 21 years. His surgical practice will focus on sports injuries of the shoulder and knee. He will also help lead the educational programs for the students, residents and fellows at Newton-Wellesley.

There are many areas of evolving collaboration between Newton-Wellesley and the MGH. In addition to the electronic medical record and digital radiologic services, our physicians are spearheading the development of a joint registry, which will be shared by NWH and MGH to further ensure the highest quality of patient care and safety.

The continued growth and development of the orthopaedic program and personalized patient care continues to occur as a byproduct of this outstanding collaboration between Newton-Wellesley and Mass General Hospital.

MGH Center for Metal-on-Metal Total Hip Replacement

Due to its potential advantages of low wear and increased stability, metal-on-metal (MoM) total hip replacement (THR) accounted for 35% of bearing surface utilization in patients in the United States (2008 data). However, the national joint registries

worldwide have recently reported a two-to-three-fold higher failure rate of THR with MoM bearings than contemporary THR with non-metal-on-metal bearings.

Since its creation in 2011, under the direction of Dr. Young-Min Kwon, the **MGH Center for Metal-on-Metal Total Hip Replacement** continues to conduct cutting-edge research and provide state-of-the-art comprehensive care to patients with metal-on-metal total joint replacements. The Center combines the multi-disciplinary expertise of the Department of Orthopaedic Surgery, the Harris Orthopaedic Laboratory and the Orthopaedic Bioengineering Laboratory. The MGH Center for Metal-on-Metal Total Hip Replacement is committed to improving the treatment and care of patients with metal-on-metal implant devices by integrating various specialized tests to provide critical evaluation and specific advice for patients with metal-on-metal implants.

In addition, the Center's surgeon-scientists continue to engage in translational research, sharply focused on fulfilling the needs of at-risk patients with MoM hip implants, and transforming their laboratory discoveries into clinical practice. The Center's research has been featured at numerous symposia and podium presentations at the Orthopaedic Research Society, the American Academy of Orthopaedic Surgeons, and the American Academy of Hip and Knee Surgeons. If you would like to refer a patient, friend, or family member to our Center, please contact us at 877-644-3889 or visit our website at http://www.massgeneral.org/ortho/metal-on-metal.

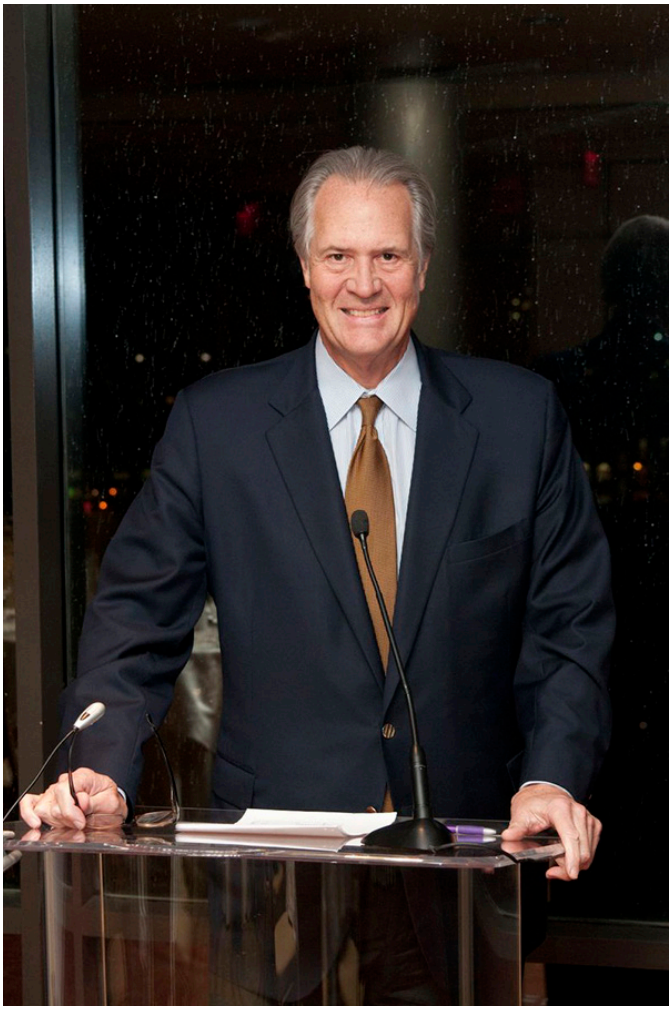
41st Annual Advances in Arthroplasty Course

"Optimizing Hip and Knee Arthroplasty Using Evidence-Based Medicine: From Early Intervention to Complex Reconstruction"

This year's Annual Advances in Arthroplasty Course marked the 41st presentation of the course, making it the longest Continuing Education Course at Harvard Medical School. In keeping with the outstanding success of the new and innovative format of last year's program highlighting today's important challenges in the field of total joint arthroplasty surgery, the focus of this year's course was applying evidence-based medicine in optimizing clinical outcomes and quality of life in patients with hip and knee arthroplasty, as well as early treatment of hip disease in young adults. Integration of clinical expertise from outstanding local, national and international faculty with the best available clinical evidence from research and national joint registry data into the decision making process for patient care was presented to address clinical challenges relevant to everyday practice. They included femoroacetabular impingement, dislocation, alternate bearings materials in contemporary use and edge wear, sepsis, the optimization of DVT prophylaxis, and the use of navigation and emerging implant designs.

The program included the 10th Annual Harris Oration by Robert Barrack, MD; keynote addresses; symposia; and the very popular video

vignettes and "live surgeries". As always, there was ample time during the "Meet the Faculty Sessions" for discussion of challenging cases and issues with the expert faculty in the field. The venue for the 41st course was the recently renovated Hyatt Regency Hotel, Cambridge and it was a tremendous success!



MGH Primary Care Orthopaedics Course

This year's annual MGH Primary Care Orthopaedics Course, under the direction of David Ring, MD, PhD, and Co-Directors Drs. Thomas Gill IV, Richard de Asla, Brian Grottkau, R. Malcolm Smith, and George Theodore, was held in May at the Harvard Club on Commonwealth Avenue in the Back Bay. This Harvard Medical School accredited program has been offered by the MGH Department of Orthopaedic Surgery for a over twelve years and teaches the fundamentals of musculoskeletal medicine to primary care providers in interactive sessions, including a casting and splinting workshop run by John Burns. We return to the Harvard Club on May 6 and 7, 2013.

Clinical Subspecialty Updates

Adult Reconstructive Surgery

The Adult Reconstructive Surgery Service at the MGH is under the direction of Dr. Andrew Freiberg, Service Chief and Department Vice-Chair. Our success this past year was multilateral with gains in clinical activity, research productivity, and faculty recruitment. The Service continues to be a leader in the orthopaedic community, delivering the most up-to-date surgical techniques, evaluation of problem joint replacements, and advanced treatments for infection and peri-prosthetic fractures.

We had a wonderful year in terms of increased productivity and efficiency, with over 1,500 hip and knee arthroplasties performed. In addition, we are proud and excited to announce that Dr. William Healy has joined the MGOA and his practice will be located at the Kaplan Center and NWH. Dr. Healy is a nationally and internationally recognized surgeon and leader in hip and knee reconstructive surgery. The combination of his skills and knowledge is a great asset to our clinical program.

The Adult Reconstructive Surgery Service had another outstanding year at the annual meetings of the Orthopaedic Research Society, The Knee Society, The Hip Society, the American Academy of Orthopaedic Surgeons, and the American Academy of Hip and Knee Surgeons. Our group had numerous podium and poster presentations at these meetings, and it was rewarding to see the academic successes and the presence of so many former fellows. Dr. Freiberg served as Program Chair for the annual AAHKS meeting in Dallas, at which a record number of papers and posters

were presented and attendance was the highest ever. Many of our faculty presented important clinical and scientific information; a highlight was a keynote address by Dr. Young-Min Kwon on Metal/Metal total hip replacement failure mechanisms. Dr. Rubash was elected Secretary/Treasurer of the Hip Society and will continue in a national leadership role over the next few years.

Our collaboration with the Bioengineering Laboratory, under the direction of Dr. Guoan Li, is ongoing as we do the groundwork to study new robotic techniques that can be applied to hip and knee surgery. We are confident that these exciting discoveries will translate into a major clinical program. In addition, extensive work with the Harris Orthopaedic Laboratory (HOL) continues as we finish recruitment into our large "Vitamin-E Highly Cross-linked Polyethylene RSA" study and the "MGH Administered International Multi-Center" study. We continue to focus on the extensive evaluation of retrieved cross-linked liners from hip and knee patients. We have contributed a significant proportion of cases to the National Total Joint Registry and continue to work with our colleagues at the Mayo Clinic to make this Registry successful.

This year marks our 51st Fellowship Class and some significant changes in our program have occurred. Dr. Young-Min Kwon was appointed as Fellowship Director and Dr. Hany Bedair was appointed as Director, Arthroplasty Fellowship Education. Although Dr. Andrew Freiberg continues to work closely on all administrative matters, including education and fellow supervision, these new faculty members provide fresh energy and ability. Our fellows this year were Drs. Ravi Bashyal, James Eberhardt, Bryan Lawless, and Scott Foster. Dr. Bashyal is practicing at Northshore University Health System in Chicago, Illinois; Dr. Eberhardt is practicing at Oakwood Medical Center in Brownstown, Michigan; Dr. Lawless is practicing at Elliot Orthopaedics in Manchester, New Hampshire; and, Dr. Foster is practicing at MedCentral Orthopaedic Institute in Mansfield, Ohio. We wish them all great success as they enter practice.

Hand and Upper Extremity Service

The Hand and Upper Extremity Service continues to expand in clinical volume, teaching programs, and clinical and basic research. The flexibility of our entire faculty has allowed the Hand and Upper Extremity Service to maintain its high standards of clinical and academic output and excellence.

Dr. Chaitanya Mudgal was the Interim Chief of the Service since March 2010, and a national search for a new Chief was underway through HMS. After an extensive process, Dr. David Ring has been appointed as the new Chief of the MGH Hand and Upper Extremity Service, bringing extensive clinical and research experience and expertise to this prestigious position.

In addition to being extremely active and clinically busy at the main MGH campus, Drs. Jesse Jupiter, Chaitanya Mudgal, David Ring, and Sang-Gil Lee have been equally as busy utilizing the excellent outpatient surgery facilities at Mass General West; Drs. Jupiter and Mudgal continue to regularly see patients there. These outreach efforts provide comprehensive patient care to individuals located far from the Metro Boston area. We also continue to benefit from the weekly clinical sessions of Dr. James Herndon, who serves as an invaluable resource for all our trainees and faculty. He sees patients at the main campus.

The Hand Surgery Fellowship is now in its sixth year as a combined fellowship with the Plastic Surgery Service. Dr. Mudgal continues in his fourth year as the Program Director. With their expertise in free tissue transfers, as well as management of brachial plexus injuries,

Drs. Jonathan Winograd and Curtis L. Cetrulo, Jr. from Plastic Surgery have greatly added to the fellows' education. The Service continues to enhance educational and academic content regularly, with updates to the "Hand CD." The fellows now have regular access to microsurgical laboratory facilities under the supervision of Mark Randolph from the Plastic Surgery Service. We are pleased with the continued collaboration of the Hand Service and Plastic Surgery, which further enhances the fellows' experience and education during their time at the MGH.

The Service continues to host Dutch, German, and Swiss PhD candidates doing research under the guidance of Dr. Ring. In the past year, Kim Brower and Geert Buize defended their respective PhDs in Amsterdam. Geert was awarded Cum Laude! We enjoy hosting surgeon observers and researchers from all over the world–many of them AO Fellows visiting Dr. Jupiter–giving the unit a cosmopolitan feel.

In an effort to increase our international collaboration, an association has also been established with Dr. Raja Sabapathy at the Ganga Hospital in Coimbatore, India. Dr. Sabapathy is an international authority on the management of complex mutilating hand trauma. It is anticipated that Dr. Mathew Thomas, who graduated in 2012, will be our next fellow to visit the Ganga Hospital later this year or in early 2013. Our previous fellows who have visited Dr. Sabapathy include Dr. Alan Chambers and Dr. Andrea Bauer. They had a terrific few weeks in Coimbatore and spoke in glowing terms of their clinical and surgical experiences.

Academic productivity continues to remain high. The Hand and Upper Extremity Service had nearly two dozen peer-reviewed publications, has produced over twenty clinical communications and review papers, and nearly a dozen book chapters. The faculty continues to be featured regularly in local, regional, national, and international symposia with roles varying from speakers to moderators to course chairmen.

Foot and Ankle Service

The Foot and Ankle Service continues to be extremely busy and is one of the fastest growing divisions in the Department. Dr. A. Holly Johnson took over as Interim Division Director after Dr. de Asla's departure earlier this year. Drs. Johnson and Kwon continue to treat a vast array of problems including complex foot and ankle deformity, trauma, sports injuries, posterior tibial tendon insufficiency, arthritis, and forefoot deformity. Dr. Johnson holds clinics in Boston, as well as MGH satellites including MGH-Northshore and Newton-Wellesley Hospital. Dr. Kwon continues to take the lead in research for the service. He has focused on clinical and translational research in the field and has many published and ongoing studies related to foot and ankle orthopaedic trauma.

Some recent developments include the hiring of Nurse Practitioner Julia Kurker to the Service. She is a welcome addition to the Department and will help deliver comprehensive care to all of the patients. In addition to working alongside the physicians, she will soon lead her own clinic offering initial non-operative care to our patients.

The Service is also looking forward to the first MGH Foot and Ankle Orthopaedic Fellow in August 2013. This one-year fellowship will offer broad exposure to all clinical and operative aspects of foot and ankle orthopaedic problems as well as research opportunities within the Department.

The Foot and Ankle Service looks forward to expanding its operations and opening a Comprehensive Foot and Ankle Center in the near future. This Center will offer a multidisciplinary approach to our most complex patients in one location. Podiatry, Physiatry, Physical Therapy, a shoe store and many other features will be hallmarks of this new Center. More to come next year!

Orthopaedic Oncology Service

Members of the Orthopaedic Oncology Service are pioneers in the areas of transplantation in limb sparing procedures and complex pelvic and spine surgery for malignant bone and soft tissue tumors. The Orthopaedic Oncology Service has been under the direction of Dr. Francis J. Hornicek, Service Chief, for more than ten years.

Orthopaedic Oncology, Medical Oncology, Radiation Oncology Services, and the members of Pathology and Radiology form the Center of Sarcoma and Connective Tissue Oncology, offering specialized multidisciplinary patient care. As part of the MGH Cancer Center, it provides comprehensive care for children and adults with bone and soft tissue tumors and is a regional, national and international referral center for these complex tumors. Drs. Kevin Raskin, Dempsey Springfield, Joseph Schwab, and Francis Hornicek continue to enhance their clinical service with additional passions including orthopaedic research and medical student and resident education. Drs. Francis Hornicek and Zhenfeng Duan run the Molecular Sarcoma Laboratory and have ongoing multiple collaborative efforts to study tumor multidrug resistance and develop novel drugs to treat cancer. They have NIH funding and are working to bring their discoveries to Phase I clinical trials for cancer patients. The clinical service has increased its surgical time and is bringing in more complex cases from around the world. Novel methods for treating large primary tumors of the axial skeleton attract these patients, who are managed in a strong multidisciplinary fashion.

The Musculoskeletal Tumor Fellowship, one of the most sought-after in the country, brings together members of Beth Israel Deaconess, Boston Children's Hospital, and the MGH to develop an undisputed world-class fellowship program. The fellowship has been in place for about 30 years and has trained doctors globally. The Orthopaedic Oncology group has a truly impressive past, a highly productive present, and a bright future that includes innovation in many areas!

Pediatric Orthopaedic Service

The Pediatric Orthopaedic Service has experienced another wonderful year under the direction of Service Chief Dr. Brian Grottkau. Dr. Grottkau is joined on the Service by surgeons Drs. Maurice Albright, Saechin Kim, and Gleeson Rebello along with Jeff Kreher, a Pediatric and Adolescent Sports Medicine Specialist (board certified in Pediatrics, Internal Medicine and Primary Care Sports Medicine). Our Nurse Practitioners Erin Hart and Alison Turner also assist in providing outstanding patient care. Dr. Grottkau reports that the Pediatric Orthopaedic Service "continues to meet and exceed the benchmarks we have set for ourselves in terms of outpatient visits, volume of surgical cases, patient satisfaction, and quality of care." Dr. Grottkau and members of the Service enjoyed another productive year of research in the Pediatric Laboratory for Tissue Engineering and Regenerative Medicine. Working in collaboration with colleagues in the Laboratory for Tissue Engineering, they are exploring a number of orthopaedic applications for the utility of patient-derived stem cells in treating Legg Calve Perthes disease, a major cause of premature arthritis in children and young adults.

The Pediatric Orthopaedic Service also continues to have a competitive clinical fellowship. Dr. Mohan Puttaswamy, who just completed an arthroplasty fellowship in Buffalo, NY, recently joined them.

Congratulations to Dr. Grottkau and the Pediatric Orthopaedic Service on another extremely productive year.

Podiatry Service

The MGH Podiatry Service clinical staff includes nine podiatrists and a certified pedorthist/orthotic technician. Under the direction

of Dr. Robert J. Scardina, members provide comprehensive ambulatory foot care (including diabetic, arthritic, sports and general), elective and non-elective foot surgery, and orthotic services in the Yawkey Building. Staff members also provide outpatient care at MGH-affiliated Health Centers (Revere, Chelsea and Charlestown) and non-MGH venues (South End Community Health Center and Lynn Community Health Center), as well as inpatient consultation services at the MGH and Spaulding Rehabilitation Hospital. Our community outreach program at the Pine Street Inn enters its 22nd year. Facing an ever-increasing demand for our services, we hope to establish a "high-risk" diabetic foot practice at the MGH Vascular Center soon, and develop satellite practices at Mass General/North Shore Center for Outpatient Care in Danvers and Mass General West in Waltham.

The MGH Podiatry Residency Program includes a comprehensive and diverse curriculum with longitudinal training experiences in clinical podiatry and foot and ankle surgery, more than 20 non-podiatry medical and surgical block (monthly) rotations, and extensive traditional and on-line didactic activities. Our teaching faculty includes more than 30 podiatrists and more than 80 physicians and surgeons. PGY-II and PGY-III residents receive training in foot and ankle surgery from over 25 faculty members (mostly podiatric, but also orthopaedic, plastic and general surgeons) at the MGH and several regional training-affiliated hospitals. As a result of a site visit conducted in May 2011, our residency program received full approval status from the Council on Podiatric Medical Education extending to 2017. We anticipate approval from the CPME soon, converting our program to the new national model (Podiatric Medicine and Surgery Residency).

Select members of our staff have provided outpatient educational experiences for MGH Medical residents for almost five years, and we soon plan to resume providing surgical training for MGH Dermatology residents. Our senior Podiatry resident participates in both the MGH Medical resident and Senior HealthWISE lecture series on an annual basis.

The 9th Annual MGH Podiatry Service Winter Lecture, "The Framingham Foot Study," was held in January 2012, with guest speaker Marian T. Hannan, DSC, MPH. Podiatrists, physical therapists, orthotists, pedorthists, and medical professionals from the MGH and other area hospitals attended the presentation.

"After almost 60 years, while preserving our identity as a separate and distinct clinical entity (and profession) at the MGH, the Podiatry Service continues to enjoy excellent patient care and educational rapport and collaboration with many other medical and surgical departments, services and divisions at the MGH. Mindful of our history and future potential, as well as our responsibility to the MGH community, our Service maintains its dedication to excellence in both patient care and graduate training, as we move closer to expanding both staff and clinical services," notes Dr. Scardina.

Shoulder Service

The Shoulder Service, under the direction of Dr. Jon J.P. Warner, has continued to advance care through clinical quality initiatives, research and teaching. This year, Dr. Warner served as the 28th President of the American Shoulder and Elbow Society. This is a premier organization for treatment of this region of the body, and much of his strategic agenda has been implemented through activities and initiatives at the MGH. This has included web-based initiatives in shared decision-making to assist patients in their selection of the best treatment option for their problem. A value-based shoulder care initiative has been ongoing with the Harvard Business School and Michael Porter's group. This has included "Time-Based Cost Accounting" (TDABC) for shoulder care, and a planned pilot of bundled payments for rotator cuff repair with a local insurer.

Central to the value-based initiatives in shoulder care is outcome measurement and transparent reporting of patient satisfaction, readmission

rates, and infection rates, which we post on our website (www.bosshin.com). This year we have begun implementing a novel Internet-based outcomes tool called Surgical Outcomes Study (S.O.S.). This promises to allow us to analyze each patient's recovery curve compared with his/her peers for the same surgical procedure.

Dr. Luke Oh continues to serve a dual role on the Shoulder (and Elbow) Service and the Sports Medicine Service. His clinical practice has grown and he has started a monthly Elbow Indications Conference for Sports and Shoulder fellows. A collaborative conference with the Upper Extremity Service is being planned as well.

Dr. Thomas Holovacs continues to manage a busy practice and teach the residents and fellows. He has also initiated a translational program in the Biomaterials Laboratory.

The Shoulder Biomechanics Lab, under the leadership of Dr. Daniel Massimini, completed several innovate dynamic anatomy studies. The first of these, which was published in the Journal of Shoulder and Elbow Surgery, analyzed the dynamic anatomy of the suprascapular nerve and provided insight into neurogenic pain with rotator cuff tendon tears. The second study analyzed the dynamic motion of the long thoracic nerve and has provided insight into the etiology of scapular winging.

Daniel continues to work toward completion of his PhD this spring. His studies of 3-Dimensional Kinematics of the normal and abnormal shoulder have given unique insight into the dynamic forces across the glenohumeral joint.

This year four fellows graduated from our postgraduate program. Lewis Shi, MD, took a position at the University of Chicago; Albert Lin, MD, returned home to Pittsburgh to work for Dr. Freddie Fu at the University of Pittsburgh Medical Center; Michael Freehill, MD, took a position in Sports and Shoulder at Wake Forrest and Arnold Alqueza, MD, has remained in Boston to work at the VA Hospital in West Roxbury.

This year's fellowship match selected four fellows from a competitive applicant pool of over 40 individuals. The fellowship program continues to be one of the most sought-after in the United States.

Finally, we have begun a national search for a Senior Shoulder Surgeon to assist with the clinical and academic load on our ever-growing service.

Sports Medicine Service

The Sports Medicine Service, under the direction of Interim Service Chief Dr. Andrew A. Freiberg, continues to experience exponential growth. A major development has been the establishment of several programs in the Brigham and Women's/Mass General Health Care Center at Foxborough. Drs. Eric M. Berkson, Luke S. Oh, and Kelly C. McInnis center their practices there.

The Mass General Orthopaedics Sports Performance Center has opened in the Sports Medicine Service. We had a truly outstanding launch event organized by Dr. Berkson and Administrative Director Janine Santimauro. The main focus of the Center, which will work with athletes at all levels of activity, will be the evaluation, study and performance improvement of baseball throwing and golf swinging motions.

Foxborough is also the trial site for the development of a Sports Medicine database, which began on July 1, 2010. A program to inform the local communities of the services offered in Foxborough has started.

Medical coverage for the Boston Red Sox, New England Patriots, Boston Bruins, New England Revolution, and a variety of local high schools and colleges has expanded. Plans are in place to extend the Service's comprehensive athletic coverage by developing a Women's Sports Medicine Program with the collaboration of Dr. Ross Zafonte and the Spaulding Rehabilitation Hospital. A Center for Concussion Treatment and Research (CCTR) has opened. Concussions in contact sports–from the Pop Warner level to the professional level–are a serious problem that has yet to be addressed in a systematic way. The Primary Care Sports Medicine Clinic, under the direction of Laurence Ronan, MD, has also opened in the Sports Medicine Center, and its patient referrals are growing.

The Sports Medicine Fellowship program continues to attract outstanding candidates from around the country. Dr. and Mrs. Zarins hosted a fantastic welcoming event where faculty could meet our new fellows and their families. The Service has a number of visiting fellows and visiting residents from the United States, Europe, and Japan. Broader teaching activities include the Sports Medicine 2010 Course given in collaboration with the Department of Radiology, and the 5th Annual New England Sports Medicine Fellows Course.

There were a number of visiting faculty speakers from around the world during this academic year. Dr. James Andrews was the Fifth Annual Augustus Thorndike Lecturer. Doctor Andrews is internationally known and recognized for his skills as an orthopaedic surgeon as well as his scientific and clinical research contributions in knee, shoulder and elbow injury prevention and treatment. In addition, he has made major presentations around the world, and has authored numerous scientific articles and books. He is one of the founding members of Andrews Sports Medicine and Orthopaedic Center in Birmingham, Alabama and also a founder of the American Sports Medicine Institute (ASMI) a non-profit institute dedicated to injury prevention, education and research in orthopaedics and sports medicine.

The Sports Medicine Research program remains very productive, and has grown due to its affiliation with the Bioengineering Laboratory under the direction of Dr. Guoan Li, the Laboratory for Musculoskeletal Tissue Engineering with Mark Randolph, the Media Laboratory at MIT with Dr. Joseph Paradiso, Spaulding Rehabilitation Hospital in association with Dr. Ross Zafonte, and the Department of Human Evolution at Harvard College in collaboration with Dr. Daniel Lieberman. Recent grants from the NFL Charities (for Drs. Gill and Berkson) and the NIH (for Dr. Gill and Mr. Randolph) have added substantial support to these programs. A new initiative on the use of platelet-rich plasma (PRP) has been undertaken by Drs. McInnis and Berkson. In the academic year 2010-2011, the faculty of the Sports Medicine Service published 22 papers. To enhance its teaching capabilities, the Sports Medicine Service established the Dinesh Patel, MD, Arthroscopy Learning Laboratory in which knee, shoulder, and ankle models are available for the fellows and residents to practice surgical techniques. Plans are underway to expand this educational opportunity even more broadly. Members of the Service also oversee training for the residents and fellows in local cadaver arthroscopy labs.

Sports Medicine Service physicians have received a number of recent honors. Harvard University honored Dr. Arthur L. Boland with the establishment of the Arthur L. Boland Award for an outstanding graduating senior athlete who plans to attend medical school. Drs. Bonvaronit Chuckpaiwong, Eric Berkson, and George Theodore were awarded the Nicola's Foundation Young Researcher Award of the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine in Osaka, Japan.

The Sports Medicine Service and the Spaulding Rehabilitation Hospital play a major role in the study of traumatic brain injury as part of the Home Base Program. A collaborative effort between the Red Sox Foundation and the MGH, the Home Base Program provides diagnosis, treatment, and rehabilitation to veterans with traumatic brain injury and post-traumatic stress disorder.

A growing focus of the Sports Medicine Service is to treat athletic injuries, including concussions in young people, and to develop sound criteria for return-to-play (parallel to our work to develop return-to-combat criteria for the military).

Congratulations to the Sports Medicine Service on all these wonderful accomplishments!

Spine Service

Now in its 13th year, the Orthopaedic Spine Service at MGH, under the direction of Dr. Kirkham B. Wood, is responsible for all aspects of spine care, teaching and research. This past year we were pleased to welcome Dr. Thomas Cha as the newest member of the Service. Dr. Cha completed his orthopaedic training at Columbia University and a clinical spine fellowship in Chicago at the famed Rush-Presbyterian Hospital. Dr. Cha's interests include the degenerative lumbar and cervical spines as well as medical economics and spine surgery. Our service also includes Drs. Brian Grottkau, Chief of Pediatric Surgery, Joseph Schwab, and Physiatrists James Sarni, Leonid Shinchuk and David Binder. Drs. James Rathmell and Christopher Gilligan are both pain specialists who work with the Pain Center here and provide a full breadth of services to our patients.

We are currently developing a comprehensive MGH Orthopaedic Spine Center. Our goal is to create a center that will be able to care for every aspect of a patient's spinal condition: from surgery to physiatry, medicine, geriatric treatments, pharmacology, physical therapy, radiology, orthotics, chiropractic, acupuncture, alternative medicines and patient education in both non-operative as well as operative settings.

The Harvard Combined Spine Fellowship has three fellows, two of whom rotate at MGH and the third at BWH. The fellows are actively involved in teaching and research programs in addition to their clinical duties. Over the last year, the Spine fellowship has authored papers in the *Journal of Biomechanics, Spine, Journal of Spine Disorders, European Spine Journal, the Journal of the American Academy of Orthopaedic Surgeons* and a number of textbook chapters.

This past year the Spine Service also hosted two Spine surgeons from overseas to conduct a year's sabbatical at MGH: Dr. Avraam Ploumis from Thessaloniki, Greece, and Dr. Jae-Hyuk Shin from Seoul, Korea.

Drs. Wood and Guoan Li and Shaobai Wang, PhD, continue to actively collaborate in the area of Spine Kinematics. Dr. Wood is using a dual fluoroscopic kinematics system to better study the motion of the cervical and lumbar spine, specifically as it applies to motion preservation and surgical treatments. The implication of this work is to provide kinematic data for our orthopaedic spine surgeons in fields such as disc replacement and fusion surgery.

The database that was begun four years ago with Dr. Henrik Malchau has been reconfigured with the help of the Red Cap system at Harvard. All patients now provide information upon arrival in the form of patient-related outcome instruments with which we are able to follow and evaluate their condition over time. The database is now quite robust with over 1,200 surgical procedures logged.

Trauma Service

The Partners Trauma Service, under the leadership of Dr. Mark S. Vrahas, MD, marked its 13th year as a combined Partners service, with notable achievements and service expansions. Dr Malcolm Smith, Chief of the MGH Trauma Service continues his humanitarian efforts, taking care of patients and improving the quality of orthopaedic care in Haiti. Thank you, Malcolm.

We launched the Orthopaedic-Geriatric co-management services at Mass General and at Brigham and Women's. Geriatric physicians from the Senior Health Services at MGH will take care of elderly patients who are admitted with orthopaedic injuries. The main goal of these services is to provide consistent age-appropriate clinical care on the orthopaedic units and throughout the hospitals for this patient population. Our program has been well-received by patients and staff alike; initial data review shows positive influences on hospital metrics such as length of stay and time from admission to the operating room. I want to welcome and thank our geriatricians, Drs. Joel Bauman and Bernardo Reyes, for helping these programs get off to such a good start. To

determine optimal care, our future plans include smoothing the many processes associated with these patients and conducting robust research about important topics such as hospital-acquired delirium and outcomes in patients with non-operative pelvic fractures.

The Trauma Fellowship program continues to attract top talent from recognized residencies in both the United States and Canada. Our 2011-12 fellows, Trevor Owen, MD, and Stéphane Bergeron, MD, came to us from The Oschner Clinic and McGill University, respectively. Dr. Owen will be heading to the International Center for Limb Lengthening to complete a one-month fellowship prior to starting fulltime work as a traumatologist at the Carilion Clinic in Roanoke, VA. Dr. Bergeron has accepted a position affiliated with McGill University in his hometown of Montreal. He will begin in September after he begins paperwork toward a Masters of Public Health degree at the Harvard School of Public Health this summer.

The Trauma Service Fellowship program has added quarterly journal clubs, feature lectures and cadaveric labs run by experts in the subject area. We look forward to continuing this important educational endeavor and extending it to all our fellowships in the Department.

Dr. Vrahas is working with the Harris Orthopaedic Lab and using radiostereometric analysis (RSA) to assess fracture healing and bone union. While RSA was developed to analyze joint replacements, this study is among the first of its kind using RSA technology in fractures. The Trauma Service also hosted the first Harvard Orthopaedic Trauma Research Day, with presentations by trauma faculty, fellows, colleagues from the orthopaedic labs, and residents. The event was a great success.

Our Orthopaedic Research Laboratories

Sarcoma and Molecular Biology Laboratory (SMBL)

The Sarcoma Molecular Biology Laboratory (SMBL) is under the direction of Zhenfeng Duan, MD, PhD, and Orthopaedic Oncology Service Chief Francis J. Hornicek, MD, PhD. The focus of the Laboratory's work is to analyze the molecular biology of sarcoma and to examine the mechanisms of multidrug resistance, to identify small molecules and targets to reverse drug resistance and to understand the molecular mechanisms governing growth, and the proliferation of human sarcoma cells.

The overall objectives of the Laboratory are to explore biological mechanisms of tumors arising in bone and other tissues. One major focus is to elucidate the mechanisms of the development of drug resistance in cancer. Previously, we have found multidrug resistance could be partially reversed by siRNA targeting of ABCB1 (MDR1) or by a combination of nanoparticles with chemotherapy drugs. Recently, we have identified two small molecules (NSC23925, NSC77037/Tetrandrine) that can overcome drug resistance in-vitro and in-vivo. These compounds and their derivatives hold significant therapeutic value in the treatment of MDR-dependent cancers. Another significant aim of the research is to define the essential kinases that are responsible for proliferation and survival of human sarcoma cells. We have discovered that several kinases, including CDK11 and PLK1 signaling, are essential in tumor cell growth and survival. In addition, translational research into new treatment options for sarcoma patients has been undertaken.

The Sarcoma Molecular Biology Laboratory has published articles pertaining to sarcoma and multidrug resistance in human cancer. Research projects have received funding from a variety of sources including NIH, foundations, corporate sponsors, and benefactors.

Laboratory for Musculoskeletal Research and Innovation (LMRI)

Adam Hacking, Ph.D, who has broad research interests related to improving orthopaedic treatment and patient care, joined our Department as the Director of the newly-created Laboratory for Musculoskeletal Research and Innovation

(LMRI). The focus of the Laboratory is to provide innovative solutions for unmet clinical needs in orthopaedics.

Dr. Hacking received his PhD in Biomedical Engineering from McGill University in 2006. He was the recipient of the Hip Society's prestigious Otto Aufranc Award in 2002 for his PhD work implicating the role of the surface morphology of plasma sprayed HA coatings in osseointegration. While working on his PhD, he co-authored a number of pre-clinical studies validating and optimizing the properties of Trabecular Metal for hard and soft tissue fixation. Dr. Hacking completed two postdoctoral fellowships, the first in the Department of Orthopaedics at McGill University and the second at the Harvard-MIT Division of Health Sciences and Technology. He has authored four book chapters and 28 journal publications, generated four patents, presented at more than 50 conferences, and has delivered numerous invited lectures.

This year we welcomed two new postdoctoral fellows, Dr. Tian Xia (MD, PhD) and Dr. Joel Goldberg (PhD); and three summer medical students, Nadia Villarroel, Jason Sherer and Sean Kelley. New research assistants include Brandon Berger, Shay Warren, Sujata Syamal and Cameron Bubar. Thanks to all for their help and dedication to the lab. Ongoing Laboratory projects encompass trauma, arthroplasty, tissue engineering and biomaterials. Specifically, these include bone and vascular tissue engineering, enhancement of fracture healing and implant fixation, development of novel surfaces to reduce implant infection, the use of non-invasive techniques to quantify implant stability, techniques to improve the evaluation of biomaterials, and the improvement of trauma care.

Dr. Hacking is also working closely with the surgical staff to develop and refine new technology. The Laboratory is equipped with large and small animal models, techniques for undecalcified histology, and testing instrumentation, and has access to micro-CT imaging, scanning electron microscopy and mechanical testing. Collaborations exist locally with Harvard and MIT and internationally with the University of Helsinki and McGill University. These collaborations broaden and complement the capabilities of the Laboratory. To visit the lab, please stop by GRJ 1120 or email ahacking@partners.org.

Laboratory for Musculoskeletal Tissue Engineering

The Laboratory for Musculoskeletal Tissue Engineering, under the direction of Mr. Mark Randolph and Dr. Thomas Gill IV, focuses on cartilage repair and regeneration in the knee. Together they have a research program exploring tissue engineering approaches to repair and regenerate traumatic sports-related injuries, particularly to the shoulder and knee. The mission of the Laboratory for Musculoskeletal Tissue Engineering is to conduct cutting-edge research in tissue engineering and regenerative medicine for repairing and regenerating musculoskeletal tissues to restore normal function to patients. The Laboratory provides training in research methodology to undergraduates, medical students, and postdoctoral research fellows. Programs have been developed in three primary areas: 1) articular cartilage repair and regeneration; 2) meniscal repair and replacement; and, 3) photochemical tissue bonding to promote healing.

One area of investigation is to develop novel hydrogel polymers for delivering chondrocytes or chondrogenic precursor cells to cartilage defects. Using this approach, cells can be incorporated into the liquid phase of the polymers, injected into a defect area, and the gel polymerized in situ. The expected outcome is that new cartilage matrix is formed as the polymer biodegrades. In-vivo results have been published using fibrin polymer, poly (ethylene glycol), and hyaluronic acid gels. A primary goal of the hydrogel studies is to translate this basic research to clinical application. A recent study by a group funded by the NFL Charities focused on the properties of cartilage engineered from elderly human chondrocytes in comparison to swine

chondrocytes (Tissue Eng Part A. 2012 Jul;18(13-14):1490-9). Ongoing work sponsored by the US Department of Defense is focused on developing photochemically crosslinked hydrogels for cartilage repair and regeneration in a preclinical large animal swine model. Previous studies have demonstrated that PEG (Tissue Eng Part A. 2011 Jan;17(1-2):161-9) and collagen (J Knee Surg 2009 22(1):72-81) hydrogels can be photochemically crosslinked to encapsulate chondrocytes to facilitate new cartilage matrix formation in nude mice. This project aims to move this technology toward clinical application. In collaboration with Dr. Robert Redmond from the MGH Wellman Center for Photomedicine, and Dr. Kristi Anseth, a chemical engineer at the University of Colorado, the group is expanding their studies on photochemically crosslinked gels such as collagen and norbornene gels. With greater understanding of cell polymer interactions, and the possible incorporation of growth factors, it may be possible to engineer cartilage that resembles native cartilage in every parameter. Other approaches are also being tested with nondegradable hydrogels. In collaboration with Orhun Muratoglu, PhD and the HOL, the group is exploring a hybrid scaffold composed of non-degradable poly (vinyl alcohol) scaffolds combined with chondrocytes for joint cartilage replacement. Several types of PVA hydrogels have been tested for cell compatibility and cartilage formation in mice with support through an Academic Enrichment Fund (AEF) grant from the Department of Orthopedic Surgery. To date, several candidate gels have been identified that support new cartilage formation. One recent publication describes the use of this PVA gel for craniofacial purposes (Bichara DA, et al, J Surg Res. 2010, Apr 24).

In addition to lesions in the articular joint cartilage, lesions to the meniscus can lead to significant morbidity in the knee. In cases where the meniscus is removed, or even partially removed, the biomechanical function of the knee can be severely disrupted resulting in articular cartilage degeneration and osteoarthritis. Some lesions can be stabilized to promote healing, particularly in the outer vascularized regions. However, lesions in the inner avascular regions do not heal, even with anchors and sutures. Previous work funded by the AO Foundation focused on tissue engineering strategies to repair lesions in the avascular regions of the meniscus. The results demonstrated an efficient means to seed chondrocytes onto polygalactin (PLGA) scaffolds, and the capacity of this cell-scaffold constructs to heal bucket handle lesions made in swine menisci. Recent work funded by the Musculoskeletal Transplant Foundation has allowed us to improve the seeding of scaffolds (J Biomed Mater Res A. 2011 Oct; 99(1):102-8) and test the utility of allogeneic chondrocytes for healing lesions in the swine meniscus. This work is nearing completion and will demonstrate the contribution of the allogeneic cells to the repair, as well as document the host's immune response to the allogeneic cells. Another strategy is to develop (cell-free) scaffolds that can be used to regenerate the meniscus after partial meniscectomy. One scaffold under study is the use of a dermal bovine collagen scaffold made by TEI Biosciences, which can be used to replace meniscus and regenerate meniscal tissue.

Torn ligaments and tendons often heal with inferior mechanical strength of the native uninjured tissue. Collagen-rich tissues can be bonded using photosensitive dyes and light. Such a strategy may have many applications in promoting healing of tendons and ligaments. One area being actively investigated is the bonding of severed tendons using Rose Bengal dye that is irradiated with green light. Additionally, protein rich materials can be used in the bonding process to augment the strength of the repair. Silk and collagen membranes are candidate materials that are under investigation in combination with photochemical tissue bonding to promote healing of tendons. A recent study to be published in *Lasers and Surgery in Medicine* (Lasers Surg Med. 2012 Aug 21. doi: 10.1002/lsm.22066.) [Epub ahead of print] describes the use of an electrospun silk

construct bonded to transected Achilles tendons in rabbits, which showed a decrease in adhesions and an increase in early tendon mechanical strength.

Bioengineering Laboratory

The Bioengineering Laboratory, under the direction of Guoan Li, PhD, has entered its 12th year and is a leader in the field of musculoskeletal engineering and biomechanics. They continue to make significant contributions to several subspecialty areas including knee, arthroplasty, and spine biomechanics. They reported the first in-vitro biomechanical measurement of reduced contact pressure in the medial compartment of the knees, when subjected to a simulated muscle loading protocol. Another exciting development in the Laboratory is the establishment of a research team with an objective to accurately determine in-vivo hip articular contact kinematics in normal subjects and patients after total hip replacement.

The Laboratory has a fabulous team of outstanding graduate students from MIT, postdoctoral fellows and research staff. This year, they are proud to appoint Drs. Ali Hosseini and Shaobai Wang as instructors. In collaboration with Dr. Warner, Mr. Massimini continues to conduct research on in-vivo shoulder biomechanics and is simultaneously working toward his PhD. Dr. Hosseini, together with Mr. Hemanth Gadikota and Mr. Jingsheng Li, has been working closely with Drs. Thomas Gill, Peter Asnis and Luke Oh on a R01 grant evaluating in-vivo knee biomechanics after ACL injuries (with and without a combined meniscal tear) and reconstruction. Dr. Wang is actively studying intrinsic biomechanics of the cervical and lumbar spine in collaboration with Drs. Kirkham Wood, Thomas Cha, Frederick Mansfield and Brian Grottkau. Dr. TsungYuan Tsai is actively concentrating on in-vivo hip kinematics using fluoroscopic imaging systems in collaboration with Drs. Young-Min Kwon, Henrik Malchau and me. The hip research team has validated an imaging method for investigation of in-vivo six-degrees-of-freedom kinematics of the hip before and after total hip replacement. This system is being used to evaluate the effect of cup orientation as well as the edge loading and impingement on patient function.

Dr. Sam Van de Velde has begun his orthopaedic residency at Leiden University Medical Center of the Netherlands; Dr. Michal Kozanek has started his orthopaedic residency at the Combined Harvard Orthopaedic Residency Program and Ms. Chelsea Garner, a former lab intern, has been accepted in the medical school of the Uniformed Services University of the Health Sciences. Congratulations! Mr. Hemanth Gadikota and Mr. Jing-Sheng Li are the lab's core bioengineers and have actively participated in a variety of clinical and biomechanical research projects. Mr. Gadikota has been conducting a series of biomechanical testing of various ACL reconstruction techniques and cartilage contact characteristics using the robotic testing system. Mr. Li and orthopaedic residents have been conducting tensile testing to identify an optimal muscle suturing technique to repair muscle lacerations. There have also been several new additions to the Laboratory. Dr. Shinzuke came from Nihon University Hospital in Tokyo to investigate the ACL biomechanics during stair ascending. Dr. Shin, an attending spine surgeon from Seoul, Korea, and Dr. Qi Yao, an attending spine surgeon from Beijing, China, joined the spine research team to help Drs. Wood and Cha in their study of biomechanics of spinal scoliosis and cervical fusion. Dr. Wei Qi from Beijing and Dr. Wang from Xian, China joined the Laboratory to examine deep knee flexion biomechanics and the femoral condyle offset after total knee arthroplasty. Mr. Martin Kosztowski, a medical student from University of Illinois Medical School, came to investigate the in-vivo behavior of MCL and LCL after TKA. Another exciting achievement is the qualification of Ms. Genevra Stone, a third-year medical student from Tufts University, to represent Team USA in the 2012 London Summer Olympics. In addition to this challenge, she has been working on several sports medicine-related

research projects at our Laboratory.

Furthermore, this year at the ORS/AAOS meetings, the team presented over 28 abstracts, including podium and presentations. They published over 30 articles in prestigious peer-reviewed journals in the areas of arthroplasty, sports medicine, spine, foot and ankle, and biomechanics. In addition, the team continued to secure several competitive grants from the NIH and other foundations to study the biomechanical intricacies of ACL reconstruction, degenerative disc disease and hip/knee arthroplasty. Another fabulous year!

Shoulder Biomotion Laboratory

The Shoulder Biomotion Laboratory enters its 8th year under the direction of Dr. Jon JP Warner and Daniel Massimini, MS. The Laboratory is quickly becoming a pioneer in the field of shoulder research, specializing in three-dimensional dynamic joint motion analyses. Using a dual fluoroscopic imaging system, Mr. Massimini developed a neural tracking technique and published the first data on tracking the suprascapular nerve during dynamic shoulder motion in a cadaver model. This past year has been especially productive with several peer-reviewed publications and a newly renovated laboratory space.

Restoring motion and reducing pain to the shoulder is far more complex than previously thought. Dr. Warner's passion is to understand all the components of shoulder patho-mechanics, unravel its riddles and discover new and exciting ways to solve the multiple problems that plague it. The Shoulder Biomotion Laboratory is looking forward to another productive year.

Daniel Massimini, MS, is a PhD candidate in the Department of Mechanical Engineering at the Massachusetts Institute of Technology. Mr. Massimini supervises all research activities within the Laboratory and concentrates his research efforts on in-vivo shoulder biomechanics. The focus of Mr. Massimini's doctoral thesis is to quantify the dynamic glenohumeral contact mechanics of the young healthy adult during the activities of daily living. This data will serve as a reference when investigating abnormal shoulder mechanics. Mr. Massimini is on track to defend his PhD in the spring of 2013.

Harris Orthopaedic Laboratory (HOL)

The Harris Orthopaedic Laboratory (HOL) is under the co-direction of Drs. Orhun K. Muratoglu and Henrik Malchau. Members of the HOL have contributed to the field of adult reconstructive surgery for over four decades. An array of different topics have been studied and major contributions have been made in the areas of implant stability, implant fixation, bearing-surface applications, and first, second, and now third generations of highly cross-linked polyethylenes.

Today, our research areas are advancing material development in joint repair and replacement under the direction of Dr. Muratoglu. The pre-clinical material research team develops novel UHMWPEs for improving the longevity of joint implants and expanding the use of joint replacement safely to younger and more active patients. Another cutting-edge area is the development of non-degradable hydrogel-based materials for integrative and mechanically feasible repair of cartilage defects at an early degenerative state. The materials research team collectively brings experience in material and polymer science, polymer chemistry, biomaterials and biomechanics testing and bench-to-clinic implant development as well as follow-up testing of explanted devices to analyze in-vivo effects.

Dr. Charles R. Bragdon, who has been a member of the Laboratory for over three decades, is leading several studies to evaluate the clinical performance of first and second generations of highly cross-linked and melted polyethylene as well as the Vitamin-E doped irradiated polyethylenes for use in hip and knee arthroplasties. It may be hard to believe, but Dr. Bragdon and I did the first uncemented titanium fiber metal canine hip replacement in the early eighties.

The combination of clinical outcomes studies and specialized RSA studies have determined that

the wear behavior of cross-linked polyethylene, in conjunction with traditional as well as large femoral heads, has been dramatically decreased with the use of this new material. These studies have shown marked reduction in wear and femoral head penetration out to ten years of clinical use. Dr. Malchau and co-investigators, who are quite pleased with these results report, "so far the first generation highly cross-linked polyethylene performs as predicted by the pre-clinical experiments and seems to be the bearing of choice in the active patient."

The clinical research team, under the director of Dr. Malchau, develops local and regional implant registries in collaboration with orthopaedic surgeons in arthroplasty, spine, hand, sports medicine, trauma, and orthopaedic oncology. They also conduct prospective clinical studies nationally and internationally on alternative bearing materials and new implant designs. This provides fast and valuable information on the performance of newly developed implants and helps compare them to historical standards. These studies also can provide feedback on surgical techniques and skills to improve clinical outcomes.

The HOL has contributed many important advances to the field of orthopaedic surgery, primarily in the area of load bearing materials, the most widely used joint-specific outcomes vehicle, and the Harris Registry, as well as a multiplicity of improvements in implant design, surgical technique, surgical instruments, and surgical approaches.

The remarkable scientists in this Laboratory had another incredible year at the ORS and the AAOS with over 40 abstracts presented. Once again the members of this outstanding Laboratory have added a tremendous amount of new

knowledge to our field. I know these important contributions will continue in the future. Here's to another fabulous year!

2011 Academic Enrichment Fund Grants

It is a great pleasure to announce the 2011 Academic Enrichment Fund Grants award recipients:

Hany Bedair, MD – "Nutrition Related Immunologic Status in Total Joint Replacement Patients"
Chaitanya Mudgal, MD, Jesse Jupiter, MD, David Ring, MD, Guoan Li, PhD and Terrill Julien, MD – "A Biomechanical Evaluation of Suture Anchor Technique for Repair of Lacerated Muscle Bellies"
Charles Bragdon, PhD – "Radiosteriometric Analysis of Fracture Healing in Distal Femur Fractures"
Erik Berkson, MD and Richard de Asla, MD – "Biomechanics of Habitually Shod and Minimalist Runners"
John Kwon, MD – "Surgical Versus Conservative Management of Sanders 1 Calcaneus Fractures: Is Non-Operative Treatment Really the Best Treatment?"

Holiday Party

This past December we celebrated our eighth annual holiday party. This enormously popular event, held at the beautiful Seaport Hotel, was a resounding success. We had over 600 guests who were treated to dinner and a magnificent evening of dancing and entertainment. We all had a wonderful time and enjoyed the collegiality and warmth of this extraordinary Orthopaedic Department.