Brigham & Women's Hospital
2012-2013 Chief's Report

Thomas S. Thornhill, M.D.

I became chairman of Orthopedics at the Brigham in 1996. We have grown from a small group dedicated predominately to arthroplasty to a much larger group that is truly representative of all adult subspecialties. Moreover, our research effort has advanced from a small amount of industry sponsored research plus some NIH sponsored research by Julie Glowacki to a well integrated research effort that shares a great deal of overlap with our rheumatology colleagues. In combination, we have over 40 million dollars of extramural research and, while we have many of the concerns of ongoing research support, we are well diversified and will continue to grow in both clinical and research efforts.

I think that the first Chairman's Corner I wrote was in 1997 and as I slide it into the autumn of my tenure as chairman, there will be many things that I will miss. I am not sure that Chairman's Corner is one of them. For all the years that I have written this, I had never received any comment until last year when there was a mix-up and no Chairman's Corner appeared from Children's, the BI or the Brigham. It was only then that my good friend and fellow resident, Peter Stern, commented on how good it was not to receive my comments.

There are lots of changes that are going on. Many people ask me, perhaps hopefully, when I will be stepping down. It is true that I am past the Harvard guidelines and the search committee for

BWH ORTHO JUNE 2013, Event to Honor Dr. Bryce Wolf as Past Chief Resident

my replacement will be coming up in the not too distant future. My intent is to leave this department fiscally sound, academically productive and a mainstay of the resident and fellow educational program. To this end we have added new people, both on the research side and on the clinical side and I am very proud of each and every addition. I am hopeful that the division chief's reports will highlight the additions to their divisions.

The overall healthcare environment is challenging in our area as I am sure it is in yours. I think that sequestration in the federal government and the Massachusetts Healthcare Provision does not favor academic medical centers. Each year we faced a budget crunch and if you add both the federal and state anticipation of 2014 we, like many of you, are far short of our budget gap. This has been a chronic problem and I still think that we will find a way to make it work.

New Collegues

Our latest additions this past year have been **Arnold Alqueza**, who has joined our hand and upper extremity group. Arnold works in our group, but is also at the VA. For those of you know Arnold, he was and is a spectacular recruit. His military background, as well as his dedication to patient care and resident education has been exemplary. Arnold is a past winner of the William Thomas award and has certainly lived up to this honor.

Our most recent colleague joining us is **Dr. Jessica Whited**. She has joined the Department of Orthopedics as a P.I. affiliated with the newly-formed Brigham Regenerative Medicine Center. Dr. Whited is a native Midwesterner who came to the Boston area to pursue a PhD in Biology at MIT, where she studied developmental neurobiology in Drosophila in the lab of Dr. Paul Garrity. She became fascinated with the ability of some animals to regenerate limbs throughout their lives and joined Dr. Cliff Tabin's lab at HMS Genetics to study the phenomenon as a Postdoc. The Whited Lab will focus on elucidating the molecular, genetic, and cellular mechanisms enabling limb regeneration in axolotl salamanders with the hope that advances in scientific knowledge about how these animals regenerate perfectly formed limbs. This will lead to therapies for humans that undergone amputation due to injury or disease to potentially regenerate functional tissue. We are delighted to have Dr. Whited as a member of the Department of Orthopedics and look forward to many collaborations within her lab.

Brigham Building

The other exciting news in the department is that we just had ground breaking for what is known as the Brigham building in the future. This will house our entire orthopedic and rheumatology outpatient service in a new facility that will be in the footprint of the old Mass Mental health. Those of our dry and wet research will also be housed in the same building. We will again be adjacent to our rheumatology colleagues both in clinical sphere and in the research arena. Interestingly, this comes full circle from my original pace where rheumatology and orthopedics coexisted at the Robert Breck Brigham Hospital. Occupancy for the new building is about 2 plus years away, but it will be an exciting new area for future growth of our department under new leadership. Our academic offices remain where they have been for the last 25 years. The old area in front of the Peter Bent Brigham facade has been completely demolished and there is a 4-story underground parking garage being built and the surface will be restored to its original 1918 appearance of lawn and gardens. While at the present time it is a bit of a mess, it promises to be a wonderful area once completed.

Residency Program Director

Our residency program, I think is at a better place than it has been in a long time. Dr. George Dyer of our hand and upper extremity group is now the program director and there is great bal-

ance between the program director, the education committee and the executive committee. We continue to recruit an incredible quality of resident and look forward to a bright future.

DR. GEORGE DYER, New HCORP Program Director and Hand/Upper Extremity Surgeon

BWH Orthopedic Clinical Services

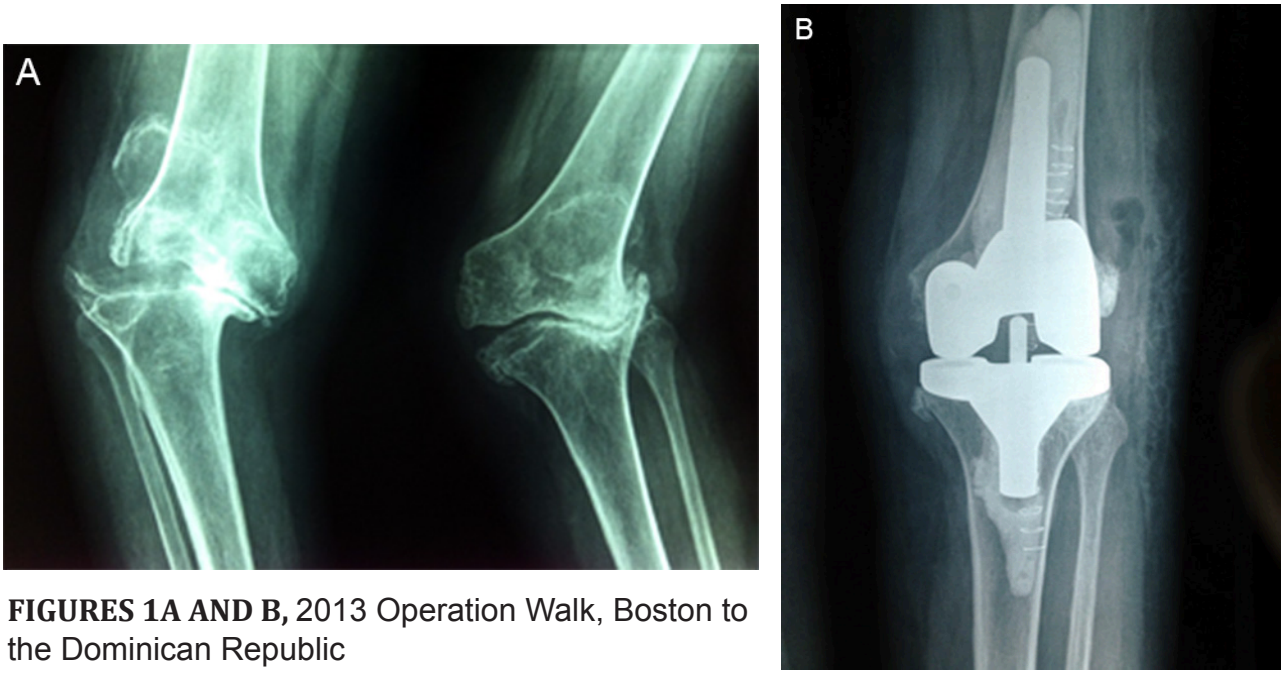
Arthroplasty Service

Let me comment a bit about the arthroplasty service and then bring in the comments of the other division chiefs. We continue to be extremely strong in both hip and knee primary and revision arthroplasty. **Dan Estok** is the fellowship director and our 3 fellows from this year were our top 3 choices. **Dr. Keith Reinhardt** from Hospital for Special Surgery will be joining an academic group on Long Island, **Dr. Josh Lindsey** from the University of Washington in Seattle will be going to his home state of Wisconsin and **Dr. Brian Palumbo** will be returning to an academic group in Tampa, Florida. These are 3 of our best in a long the line of tremendous fellows and we are very proud to have them in our family. I think that the strength of our fellowship has been its diversity. Both **Greg Brick** and **John Ready** do the majority of their hips through a direct anterior approach, while the rest of us continue with a mini posterior approach. This gives the residents and the fellows an opportunity to see many different options. Another significant component of our arthroplasty fellowship is the added value brought by **Tom Minas** as he does over 100 osteotomies a year and our Cartilage Repair Center (CRC) is the largest in the country. More about the CRC in the Sports division report.

Operation Walk Boston

One of the most rewarding aspects of the Arthroplasty Service has been and still is our program of Operation Walk Boston. Operation Walk Boston is now in its 7th year. The first year I took 2 people with Operation Walk Denver, to Panama and since then we have been going as Operation Walk, Boston to the Dominican Republic (DR). Our hospital is Plaza de Salud in Santo Domingo This past year, we did 61 total hip and total knees of a severity that you can see in Figure 1. When I started at the Robert Breck Brigham Hospital in 1979, many of rheumatoid patients were in this shape as there were no good disease modifying drugs. Fortunately, we do not see this anymore in Boston and most of the severe rheumatoids that I operate on are actually in the Dominican Republic.

The five surgeons that went with us this year were **Dennis Burke** from the Massachusetts General Hospital, **David Mattingly** from the New England Baptist, **David Dalury** from Baltimore (our former fellow), **Wolfgang Fitz** from BWH



FIGURES 1A AND B, 2013 Operation Walk, Boston to the Dominican Republic

and me. We took five anesthesiologists (all with BWH connections) and a team of about 50 people, all volunteers. Roya Ghazinouri, former supervisor of inpatient PT and now working in BWH care improvement has been on every mission and is the COO organizing a large group of talented and dedicated professionals from Nursing, PT, PACU, Pharmacy and CPD. **Dr. Jeff Katz** who heads our outcomes research group has gone with us the past several years and we have now written over 5 papers that highlight the outcomes in these patients. It is very interesting that the slope of the improvement in these patients is actually greater than what we see in Boston. Jeff has created a program that brings several volunteer HMS students who are invaluable in the research effort.

Moreover, Op Walk Boston is now an integral part of the HCORP Residency. Started by Coleen Sabatini several years ago, this has morphed into a robust program where we take a PGY3, 4 and 5. Each functions in key roles both surgically and heading our three services. This past year our PGY 3, Carl Harper additionally ran the blog, Ellen Fitzpatrick PGY 4 was our CMO and Colin May our PGY5 on his third mission was active in surgery, patient care and education or DR students.

I am very proud of the fact that we do not operate on anyone in the Dominican that we would not operate on here and the patients are thoroughly evaluated preop. Moreover, our Dominican colleague, **Dr. Luis Alcantera** keeps a watchful eye on this patient population. We will go back next spring for our mission. I find this one of the most rewarding things that I have done in my career and I would strongly suggest that any of you with the opportunity get involved in one of these endeavors do not miss the chance.

Spine Service: Dr. Chris Bono

The spine service has continued to strengthen over the past year. **Drs. Ferrone and Harris** have developed an outstanding combined spine tumor service. In addition, they have initiated a multi-disciplinary spine oncology conference that meets once a week to discuss interesting and challenging cases which includes medical oncology, radiation oncology, radiology, neurosurgery faculty members. The service was sad to see Amanda Steinberg return to New York in March, who served as a physician assistant for Drs. Bono and Harris over the past 6 years. Her devotion to the spine service was exemplary, not to mention her service as lead PA for the department. We will

be welcoming her replacement, Cara Patten, PA in mid-June, who will work with both Drs. Bono and Estok. Steady as ever, Dr. Brick continues to have a bustling spine practice. As he will soon turn 60 years old, Dr. Brick will finally rotate off of the spine call schedule!

The combined BWH-MGH spine fellowship aged one more year. This year's fellows have done a great job here at BWH. **Rayhan Jalal** will be moving back to Canada to complete another fellowship. **Ravi Ramachandran**, who joined us after completing his residency at Yale, will be crossing the country to join a private practice in California. **Phillipe Phan**, a Parisian who joined us via Canada, will be starting an academic position at Ottawa Hospital.

The spine service has been steadily productive. We are nearing completion of a randomized controlled trial of different postoperative restriction regimens following lumbar discectomy. From that database of information, one of our fellows, Ravi Ramachandran has completed a rather interesting study correlating preoperative function with improvements following surgery. **Dr. Harris** has hit it big once again with a trio of studies regarding the outcomes of spinal epidural abscesses. One of his papers recently was awarded "Best Clinical Paper" at the annual meeting of the International Society for the Advancement of Spinal Surgery in Vancouver, BC, co-authored by **Sang Kim**, one of last year's residency graduates, who is currently completing his spine fellowship at Washington University in St Louis. At the most recent annual meeting of the North American Spine Society, one of **Dr. Bono**'s papers (co-authored by **Andrew Simpson**) that examined inconsistencies between published abstracts and manuscripts was the number 2 paper in the "Best Paper Session". This work is currently under review at The Spine Journal.

Beyond these works, the spine attendings at BWH continue to be extremely active in both the academic and organizational arenas. Since May of 2012, **Dr. Bono** has had 11 additional paper's published, in addition to a number of book chapters, and several others that are in press; **Dr. Harris** has had 4 spine publications. Notably, **Dr. Harris** is the Spine Section editor for the forthcoming edition of Orthopaedic Knowledge Update (OKU). **Dr. Ferrone** has recently co-authored an important paper concerning the effects of radiation and postoperative wound complications in the extremity and trunk.

Within the past year, **Dr. Harris** has become a member of the board of directors of the North American Spine Society in addition to serving as the chair of the Governance Committee. **Dr. Bono** has assumed the role of Treasurer for the North American Spine Society, while starting a new task force de novo that is developing coverage policy recommendations for spine care. Both **Dr.s Harris and Bono** have given numerous paper presentations around the world and grounds lectures at many prominent institutions. **Dr. Bono** oversaw the recent meeting of the International Society for the Advancement of Spinal Surgery as overall program chair. In October, he was the 15th Annual Leach Visiting Professor at Boston University, and in May he was a visiting professor and lecturer at the 42nd annual meeting of the Japanese Society for Spinal Surgery and Research in Okinawa. **Dr. Bono** continues to service as deputy editor of orthopaedic surgery for The Spine Journal and deputy editor of CME for JAAOS. **Dr. Bono** has also assumed a second term as the chair of the Spine Special Interest Examination for the AAOS.

Sports Medicine/Shoulder Service: Dr. Larry Higgins

The Brigham and Women's Sports Medicine/Shoulder Service continues to develop as a world class and internationally renowned program in these subspecialties. The team of physicians has expanded through academics, research, education, and clinical productivity. The Shoulder Service, Cartilage Repair Center, Advanced Center for Cartilage Repair, Shoulder & Sports Injuries (ACCSS), and Women's Sports Medicine Program make up the core of the Service which continues to serve as a worldwide referral center for complex

sports medicine injuries. In the past two years the team has grown to seven Attending physicians on the Service with the addition of **Dr. Elizabeth Matzkin, Dr. Nitin Jain** and **Dr. Arnold Alqueza**. **Dr. Elizabeth Matzkin** has been appointed as the Surgical Director, Women's Musculoskeletal Health and Assistant Professor of Orthopedic Surgery at Harvard Medical School. **Dr. Nitin Jain** is a non-surgical Shoulder and Sports Medicine specialist, and is a faculty member in the Departments of Orthopedics and Physical Medicine and Rehabilitation (PM&R) at Harvard Medical School. **Dr. Arnold Alqueza** is the Chief of Upper Extremity Orthopedics VA Boston Healthcare System, and Orthopedic Instructor, Hand and Upper Extremity at Harvard Medical School. These physicians, along with **Dr. Tom Minas, Dr. Andreas Gomoll, Dr. Laurence Higgins**, and **Dr. Scott Martin** work collaboratively to provide the best care possible for not only routine issues, but for unique cases in areas such as Cartilage Repair and Women's Sports Medicine. Services are delivered to patients throughout the expanded Partners Healthcare Campus at the main hospital 45 Francis Street in Boston; 850 Boylston Street in Chestnut Hill; Brigham and Women's Faulkner Hospital in Boston (Jamaica Plain) and 20 Patriot Place in Foxborough.

Dr. Higgins has been the Chief of the Sports Medicine/Shoulder Service since 2005. In this role Dr. Higgins is responsible for working with his colleagues to ensure that they deliver superlative care to every patient through cutting-edge techniques, educational resources and growth in patient volume. **Dr. Higgins** also serves as the Fellowship Director of the BWH/MGH Shoulder and Elbow Fellowship Program which trains four fellows each year in the advancement of knowledge through research and clinical management of all problems affecting the shoulder. **Dr. Higgins'** runs a busy clinical practice to thrive as a premier shoulder care center with his complex and revision surgeries, including treatment of rotator cuff injuries, shoulder instability, complex shoulder fractures, shoulder replacement and knee instability (in particular ACL, PCL and complex ligamentous injuries). **Dr. Higgins** commitment to National Orthopedic Societies is evident by his recent appointments in numerous leadership roles. He is presently serving as Chairman of the ASES Value-Driven Shoulder Committee and ASES Membership Committee; and also Chairman for the AAOS Sports Medicine Safety and Quality Summit Steering Committee. **Dr. Higgins** maintains a robust research practice and currently serves as the Principle Investigator on over 10 active projects. His recent work has centered upon clinically relevant projects involving instability (Latarjet study) and timing of rotator cuff repairs, both of which have significant clinical implications in the current management of these conditions. Additionally, **Dr. Higgins** continues to investigate the determinants of cost drivers in Orthopaedic surgery publishing on volume effects in Total Shoulder Arthroplasty, Rotator Cuff Repairs and Proximal Humeral Fractures. The body of work on the economics of cost drivers in Orthopedic Surgery has blossomed into a collaborative relationship with Professor Michael Porter and Professor Robert Kaplan from the Harvard Business School. A prospective time driven activity based cost accounting (TDABC) study examining outpatient surgical management of rotator cuff tears is the first of its' kind will be completed by Summer 2013.

Dr. Martin serves as the Fellowship Director of the BWH Sports Medicine ACGME Accredited Fellowship Program which continues to attract candidates of the highest caliber each academic year. The program trains two fellows who rotate with all Attendings on the Service and provide team coverage for professional, college and high school level athletics. Active participation in the field of care for the injured athlete offers a specialized and broader experience for the sports fellow including weekly training room teaching. The Sports Medicine Service also offers a bioskills anatomy lab that concentrates on teaching psychomotor and eye-hand coordination to carry out a multitude of surgical procedures on both

models and cadaveric specimens. **Dr. Martin** was recently presented with the Faculty Award for Excellence in Mentoring and Advising by the Harvard Medical School Class of 2013.

Dr. Minas is the Director of the Cartilage Repair Center at BWH and is a national and international leader in his work on cartilage repair and his expertise with autologous chondrocyte implantation (ACI). He has performed two of the only ACI's in the hip joint in the United States and he has also performed over 400 ACI's. He has also designed an interpositional device (Conformis) and patellofemoral joint prosthesis to help osteoarthritic patients avoid a total knee replacement.

Dr. Gomoll has an active clinical and research interest in cartilage disorders, and performs cartilage repair procedures, osteotomies and meniscal transplantation. **Dr. Gomoll, Dr. Higgins, Dr. Jain, Dr. Matzkin** and **Dr. Jon JP Warner** (MGH) collaborate on the Rotator Outcomes Workgroup (ROW) study. This is a multi-year prospective study about the clinical diagnosis and management of rotator cuff tears. Approximately 200 patients are currently enrolled with a target enrollment of 350+ patients. The diagnosis component focuses on sensitivity and specificity of clinical shoulder exams in confirming rotator cuff tear prior to imaging studies. The second aim is to assess the outcomes of surgical treatment versus conservative management. **Dr. Minas** and **Dr. Gomoll's** reputation as leaders in the repair of Cartilage and Osteotomies is worldwide. They recently received the Insall award from the Knee Society for work on the long-term outcomes of ACI.

Dr. Matzkin is the director of the Women's Musculoskeletal Program at the Brigham and Women's Hospital, and coordinates a robust research program focusing on Women's Health. Her team includes the addition of a new PA, Kaitlin Whitlock and also Emily Curry as Research Assistant to the Women's Musculoskeletal Program. **Dr. Matzkin** was recently appointed to the AAOS Communications Cabinet, AAOS Women's Health Advisory Board and as Editor of the Arthroscopy Journal. **Dr. Higgins** and **Dr. Matzkin** serve as Co-PIs on

DR. ELIZABETH MATZKIN, Director of Women's Sports Medicine, BWH

an ongoing research study of orthopaedic sports medicine, arthroscopy and related surgery registry using the web-based Ortho Illustrated Surgical Outcome System (SOS). This goal of this registry is to create a database of all surgical patients and report clinical outcomes at important milestones in their recovery, over a 5-year period. **Dr. Matzkin** is beginning a collaborative study with Smith College to determine the prevalence of female athlete triad among college athletes at Smith College and Mount Holyoke College. Other research projects that Dr. Matzkin and her research team are focusing on include: Relationship of Internet or Social Medial Usage and Patient Referral Patterns in Orthopedic Surgery; and The Influence of Sex on Compensation and Satisfaction in Orthopedics.

Dr. Jain's research interests are focused on shoulder disorders, and he is currently PI on a NIH funded K-23 grant on rotator cuff tears. Dr. Jain has published in the area of spinal cord injury including shoulder pain in wheelchair users. **Dr. Jain** has an active clinical practice with a focus on patients with shoulder issues and the use of musculoskeletal ultrasound for therapeutic and diagnostic purposes.

Dr. Alqueza graduated from the Harvard Combined Orthopedic Residency Program in 2010 and then completed a Hand and Upper Extremity fellowship and also a Shoulder and Elbow Fellowship at the Brigham and Women's/Massachusetts General Hospital. **Dr. Alqueza** is gearing up a busy practice with services at BWH including hand and upper extremity and shoulder care. His current research focuses on Thumb CMC Arthritis, Rheumatoid Arthritis and he is also participating in a Rotator Cuff Utilization Study.

The Sports Medicine/Shoulder Service draws upon the unique talents of each of his members and continues to expand its footprint across the greater Boston area. The team as a whole has recently committed to the collection and documentation of outcomes measures for surgical patients in order to demonstrate their high quality care. Expanded coverage for college athletics and sponsorship of Rehabilitation Services Education events offers relationship building opportunities for not only the Sports Service, but the Brigham and Women's Hospital as a whole. Ongoing growth is made possible by the network of colleagues and reputation of the services the team delivers.

Hand and Upper Extremity Service: Dr. Barry Simmons

This has been another exciting and outstanding year for the Hand and Upper Extremity service at the Brigham&Women's/Faulkner Hospital. The Service, directed by **Barry P. Simmons, M.D.** and including **Philip E. Blazer, M.D., Brandon E. Earp, M.D.** and **George S.M. Dyer, M.D.**, welcomed an addition to the faculty, **Arnold Alqueza, M.D**.

Philip E. Blazar has been promoted to Associate Professor of Orthopaedic Surgery at Harvard Medical School and continues to be Director of the Harvard Hand and Upper Extremity Fellowship combining the BWH and Children's Hospital. In this role, he has been the driving force in the educational efforts of the Service, both in didactic conferences and research. There were an extremely large number of applicants for Hand/Upper Extremity fellowships this year and we were fortunate to attract and match with 3 outstanding residents. His academic pursuits are broad concentrating on the treatment for Dupuytren's disease, osteoarthritis of the thumb carpometacarpal joint, distal radius fractures and long-term outcomes of surgical treatment for carpal tunnel syndrome.

Brandon E. Earp now is the Chief of Orthopaedic Surgery at BWH/FH, quite an accomplishment. This well-deserved appointment allows her to not only continue her very active clinical role in clinical care and the fellowship but also helps mold the future of Orthopaedic care in our sister institution. Her interest continue to be in traumatic injuries of the upper extremity, reconstructive surgery of the shoulder, elbow and wrist but also the long-term outcomes of surgical treatment for carpal tunnel syndrome; she is the senior author for the JBJS article on long-term follow up on carpal tunnel release, "Outcomes of Carpal Tunnel Release at a Minmum of Ten Years". She is pursuing a similar study on cubital tunnel release.

George S. Dyer, M.D. has been appointed Director of the Harvard Combined Orthopaedic Residency Program (HCORP). This is a phenomenal accomplishment and shows his interest and commitment to resident (and fellow) education. It was a difficult decision, leaving his position as Chief of the Hand/Upper Extremity service at the Veterans Administration Hospital where he had made that institution the center for Upper Extremity care throughout New England. However, this appointment allows George to pursue

his love of medical education. He has already made significant changes to the educational process. In addition, he continues to excel in another administrative and educational arena, Global Health. His paper on "Disaster Triage after the Haiti Earthquake" allows him to combine his skills from his time on disaster management for the US Air Force and his Orthopaedic skills. His practice continues to involve the whole upper extremity, trauma and reconstructive surgery, especially the elbow and shoulder.

George's departure from the VAH allowed us to have **Arnold Alqueza** return as a member of the staff of both HCORP and the Harvard Hand and Upper Extremity Fellowship. Arnold completed his Orthopaedic residency in the Harvard Combined program in 2010 where he won many of the awards as the outstanding resident. He followed this with a year Hand/Upper Extremity Fellowship at MGH and then 7 months as the shoulder fellow in the Harvard Shoulder fellowship.

Arnold attended the US Naval Academy in Annapolis as he wanted to become a pilot. However, along the way he became enchanted with medicine and decided to attend medical school. This required a change in his plans for the USN as flying required a 7 year commitment so Arnold switched to the submarine service, a 5 year requirement. He was the senior nuclear officer on his submarine. After leaving the USN and completing his pre-med requirements, he attended medical school at the University for Florida before starting his residency. After a year of dalliance with Orthopaedic practice in Florida, a position became open at the Veterans Administration Hospital where he became director of the Hand and Upper Extremity. He has also joined our staff at BWH/FH.

Barry P. Simmons continues a vigorous clinical and academic role, emphasizing his efforts in treatment of the arthritic hand and wrist as well as fellowship education. His interest in outcomes continues and prompted the long-term follow up on patients undergoing carpal tunnel release.

The Harvard Combined Orthopaedic Fellowship, which includes the Hand and Upper Extremity service at Children's Hospital, continues to attract a large number of talented applicants. Now in its 31st year, we continue to train 3 fellows a year. The cross-rotation with the fellowship at the MGH, started in 2000, continues. Our current fellows are **Kristen Fleager**, a Stanford resident, who will be joining one of our former fellows in practice in Dallas, TX; **Christopher Got**, a Brown resident who will be returning to Providence to join the Hand/Upper Extremity Service there, and **Kathryn Hanna**, a Lieutenant Commander in the USN, who completed an 8 month deployment to Afghanistan, and will be returning to the US Naval Hospital in Coronado, CA, where she will be joining another of our former fellows, before she completes her military requirement.

All in all, it has been a fantastic year.

Foot and Ankle Service: Dr. Chris Chiodo

The Brigham Foot and Ankle Division remains productive and continues to grow. We are incredibly excited to have **Dr. Jeremy Smith** join the team. Dr. Smith is a graduate of the Harvard Combined Program and completed his Foot and Ankle Fellowship at the Brigham. He now sees patients at the Faulkner and also at our 850 Boylston satellite. Dr. Smith is already involved with research and teaching and doing a great job. We also welcome Adrienne Bonvini, PA-C. She joins Shari Vigneau PA-C and Samantha Noonan PA-C, who are critical to the team's success. Adrienne is quickly integrating into the Division and doing a great job. **Drs. Bluman** and **Chiodo** remain busy. They are also active within the AAOS and AOFAS. Their Instructional Course Lecture on Ankle Tendon Transfers at this year's academy meeting was very well-received. Their research on ankle replacement and the adult flatfoot is progressing nicely. **Dr. Bluman** sits on the Board of the American Orthopaedic Foot and Ankle Society and is Chair of the Public Education Committee. **Dr. Chiodo** is Chair of the Evidence Based Medicine Committee and has also been appointed Deputy Editor of the Journal of the American Academy of

Orthopaedic Surgeons. Our Podiatrists remain active and continue see patients at the main campus and at all satellites. **Dr. Regina Mostone** is now fully integrated and has become a valued member of the team. Under **Dr. Jim Ioli's** leadership, volume has increased. Dr. Ioli also remains active writing for Harvard Health Publications.

Podiatry Division: Dr. James Ioli

The BWH Podiatry Division as part of the foot and ankle service is under the leadership of **Dr. James P. Ioli**, and provides ambulatory foot care and out-patient surgery at the BWH main campus as well as the Brigham satellite locations at 850 Boylston Street, Braintree Rehabilitation Hospital and BWH/MGH Health Center in Foxboro. **Drs. Stuart Kigner** and **Regina Mostone** are also involved in delivering quality patient care to both out-patients and in-patients at the Brigham. Dr. Mostone has recently started seeing patients at the 850 Boylston Street location. **Dr. Ioli** serves as chief at the BWH and the BWHF Hospitals. He is responsible for 15 staff members from both institutions. Podiatry residents from the Harvard affiliated Cambridge Health Alliance rotate with the podiatric surgical staff at the BWHF Hospital.

BWH Musculoskeletal Research Program

Skeletal Biology Research Laboratory: Dr. Julie Glowacki

Professor **Julie Glowacki, Ph.D.** is Director of the Skeletal Biology Research Laboratory, which studies basic, clinical, and translational aspects of skeletal pathophysiology, skeletal cell differentiation, effects of age and vitamin D status on bone physiology, mechanisms of chondro/osteoinduction, and tissue engineering approaches for skeletal regeneration. The group studies human bone and cartilage cell differentiation with marrow tissues that are discarded during orthopedic surgery. They have discovered that different aspects of in vitro cell behavior are influenced by age, gender, vitamin D status, obesity, and kidney function of the subject from whom the cells were obtained. The goal is to prevent or reverse bone cell aging by safe and effective means.

The Laboratory is supported by grants from the NIH and other national and international foundations and associations. Much of the research concern various effects of age on osteoblast progenitor cells and focus on ways to mitigate age-related bone loss. Tissue engineering research involves the regulation of chondrocyte and osteoblast differentiation, optimization of Dr. Shuichi Mizuno's tissue bioreactor, and mechanisms of actions with differentiation agents to enhance histogenesis.

Translational and clinical research continues our multidisciplinary program to improve follow-up management of osteoporosis in fragility fracture patients, expand fracture pathways with other in-hospital caregivers, the natural history of osteoporosis in patients with osteoarthritis, importance of vitamin D status for skeletal health.

Dr. Glowacki continues to serve the department as Co-Chair of the BWH Musculoskeletal Research Center of Excellence, representative to the BWH Biomedical Research Institute's Research Oversight Committee, and as Professional Standards Officer for BWH Research Staff. She is a member of the Harvard Medical School Standing Committee on Conflicts of Interest and Commitment. She serves on the National Scientific Advisory Council of the American Federation for Aging Research. She is Chair of the Bone Section of the NASA, Human Health and Countermeasures (HHC) Element Standing Panel. She is on the NIH review panel for musculoskeletal SBIR/STTR applications. Since 2011, she has been a member of the Professional Practice Committee, American Societry for Bone and Mineral Research. She was a Science Fair Judge at the Boston Latin Academy, Boston, MA. She received the Outstanding Alumna Award, Girls' Latin School, and the 2013 Distinguished Senior Faculty Award, Harvard School of Dental Medicine. In the last academic year, Dr.

Glowacki published 7 original research papers, 1 report of an ORS session for BoneKey, and a chapter in Evidence-Based Women's Oral Health, a special issue of the Dental Clinics of North America.

Shuichi Mizuno, Ph.D. studies ways to manipulate chondrocyte behavior by changes in mechanophysiological factors. He continues to refine his patented tissue bioreactor/processor. He developed a novel cell culture system that allows incubation of cells within a semipermeable membrane pouch for manipulation of osmotic and hydrostatic pressure. Recent studies revealed that loading as well as off-loading of hydrostatic pressure affect chondrocyte gene expression. He reported that off-loading pressure maintained upregulation of anabolic genes and downregulation of catabolic ones. The overarching goal of these efforts is to manipulate metabolic function of chondrocytes for tissue regeneration. Since 2011, he has been Adjunct Lecturer at Jikei University School of Medicine Tokyo, Japan. He received a 2012 Musculoskeletal Best Paper Award from the BWH Biomedical Research Institute for Am. J. Physiol-Cell Physiol. 2011;300:C1234. He served as an external examiner of a Ph.D. candidate in the Department of Chemical Engineering, Queen's University, Kingston, Ontario.

Shuanhu (Joe) Zhou, Ph.D., investigates how aging affects the interactions of marrow skeletal and hematopoietic cells and the declining ability to generate new bone-producing cells. His overall goal is to contribute new information to basic skeletal biology and orthopedic science using human primary cells, and to understand the mechanisms of skeletal aging and to develop new therapeutic opportunities for aging-related skeletal diseases. He is committed to an academic research career in the field of biogerontology and orthopedic science, focusing on adult stem cells, their cellular microenvironment (niche) and skeletal aging. He is developing approaches to keep adult stem cells healthy and to mitigate skeletal aging. In past academic year, **Dr. Zhou** published 7 peer-reviewed papers in high-impact journals as the first and/or corresponding author or co-author. One of his papers, J Bone Mineral Res. 2012;27:1992, received a 2012 Musculoskeletal Best Paper Award from the BWH Biomedical Research Institute. He is a reviewer for eleven scientific journals and two grant-awarding foundations. In 2012, he was appointed as Affiliated Faculty of Harvard Stem Cell Institute. He serves on the National Scientific Advisory Council of the American Federation for Aging Research.

Citations: Skeletal Biology Laboratory

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OrACORe, Outcomes Group: Dr. Jeff Katz and Dr. Elena Losina

The Orthopedic and Arthritis Center for Outcomes Research (OrACORe) consists of ~ 15 investigators, research staff, pre- and post-doctoral trainees and students. The team is dedicated to rigorous clinical and policy studies of pressing questions in musculoskeletal health with particular focus on osteoarthritis, knee, shoulder and hip problems and orthopedic interventions. The OraCORe team had a productive 2012-13 academic year. Several publications and grant awards are highlighted here:

- We reported initial findings from MeTeOR Trial (Meniscal Tear and Osteoarthritis), a seven center randomized controlled trial of arthroscopic partial meniscectomy vs. standardized physical therapy regimen for patients with symptomatic meniscal tear and concomitant symptomatic OA.[1] The efficacy of surgical vs. rehabilitative approaches to meniscal tear in this setting OA had not been examined previously in a multicenter RCT.
- We examined the cost effectiveness of disease modifying therapy for osteoarthritis.[2] As of today, there are no established disease-modifying medications for OA and this study examined the circumstances in which such an agent could be cost effective.
- We estimated the burden of knee replacement in the United States.[3] This was the first study to estimate the total number of individuals in the US who have received knee replacement across the age spectrum.
- We reported results of analyses of the lifetime risk and age at diagnosis of knee OA in the US.[4] This study underscored the very high risk of OA among the obese.
- We reported the cumulative risk of reconstruction for patients with ACL injury seen at a referral center and we evaluated factors associated with the decision to perform surgery in patients with ACL injury.[5]
- We reviewed the clinical examination of the shoulder in patients with suspected rotator cuff disorders.[6]

Dr. Elena Losina, OrACORe co-Director, received two NIH grants this year as well. One is a large R01 award to use the Osteoarthritis Policy Model to examine policy relevant questions pertaining to pain management in patients with osteoarthritis. The other is an R21 award to examine the efficacy of using financial incentives and/or behavioral interventions to optimize outcomes of rehabilitation following total knee replacement. **Dr. Katz**, OrACORe Director, was awarded funding from NIH to follow the MeTeOR cohort for another five years to examine clinical and imaging outcomes in this valuable cohort with meniscal tear and osteoarthritis. **Drs. Katz** and **Losina** are Principal Investigators of an NIH funded T32 training program that was approved for another five years of funding.

Orthopaedic Nanotechnology Research Program: Anuj Bellare, Ph.D.

Research Interests

Our laboratory focuses on the following research areas : Polymeric Biomaterials; Implant Tribology, Nanostructured materials for tissue constructs and drug delivery; x-ray and neutron scattering of polymers; Biomechanics of biomaterials and tissue.

Members & Collaborators

1. Dr. Thomas S. Thornhill, M.D., Dept of Orthopedic Surgery, Brigham & Women's Hospital, Boston, MA, USA

2. Professor Robert E. Cohen, Ph.D., Dept of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, USA

3. Professor Lisa A. Pruitt, Ph.D., Dept of Mechanical Engineering, University of California at Berkeley, Berkeley, CA, USA

4. Professor Robert Field, Balliol College, University of Oxford, UK

5. Professor Junjie Wu, Durham University, UK

6. Dr. Alessandro Bistolfi, M.D., Centro Traumatologico Ortopedico, Università di Torino, Turin, Italy

7. Professor Franziska Groehn, University, Interdisciplinary Center for Molecular Materials, University of Erlangen-Nuremberg, Germany

8. Dr. Stephen Spiegelberg, Cambridge Polymer Group, Boston, MA

9. Shi-Shen Yau, Stryker Orthopedics Inc, Mahwah, NJ

10. Natalie Hope, M.D., Research Fellow, Imperial College, UK

11. David Zernik, B.S., Research Assistant, Harvard Extension School, Cambridge, MA

12. Nathan Eberhart, B.S., Research Assistant, Harvard Extension School, Cambridge, MA

13. Hung Ngo, B.S., Research Assistant, Harvard Extension School, Cambridge, MA

14. Andrew George, Medical Student, University of Birmingham, UK

15. Robert Dorfman, Research Assistant, Oxford University, UK.

The goal of this research program is to apply Nanotechnology to formulate high-performance biomaterials for application in orthopedic implants, tissue regeneration and drug delivery. Some of our ongoing projects and capabilities are as follows:

Total Joint Replacements

In this academic year, we have been developing new technologies for highly crosslinked polyethylene, which, while having high wear resistance, has lower mechanical properties compared to uncrosslinked polyethylene. One technology focuses on disentangling polyethylene and then crosslinking it, in order to produce a less tight network of entanglements and crosslinks, thereby making the polymer less brittle, and perhaps more suitable for high stress applications, such as in thin components and knee replacements. Additionally, we have been investigating alternate antioxidants to stabilize irradiated polyethylene against oxidative degradation. We showed that lower molecular weight hindered phenols are more effective in stabilizing polyethylene compared to Vitamin E and Irganox.

We are also currently collaborating with Durham University, University of Oxford and the Massachusetts Institute of Technology, to develop new processes to improve the fusion of polyethylene powder in implant components, which would lead to enhanced mechanical properties compared to state-of-the art polyethylenes, in clinical use today.

Our laboratory is also collaborating with the group of Professor Groehn at the University of Erlangen-Nuremberg to develop radiopacifier nanoparticles encapsulated in a gel, in order to develop bone cements with higher fatigue strength compared to state-of-the-art cements.

We have begun to investigate the morphology and macromolecular characterization of polyether ether ketones, which are finding use in trauma and for spine applications, and are also being investigated for hip replacement prostheses. This study is in collaboration with Stryker Orthopedics Inc and Cambridge Polymer Group.

Nanofiber synthesis

We are currently developing novel methods of synthesis of nanofiber, nanorods and nanofiber meshes. While the most common method is to use electrospinning, we are developing alternate methods that do not involve high voltages, such as spraying, extrusion and template synthesis. Nanofibers of a variety of biocompatible

polymers are being studied, both non-degradable as well as degradable polymers. The non-degradable polymer nanofibers will be candidates for sutures while the degradable nanofibers and nanofiber meshes have application as scaffolds in tissue engineering. Incorporation of antiobiotics and other pharmaceutical compounds will enable these high surface area nanostructured materials to be used for drug delivery options as well.

Micro and nanoparticle synthesis

We are using supercritical carbon dioxide based solvent-antisolvent techniques to synthesize mico and nanoparticles of a variety of compounds and polymers for application in total joint replacement prostheses as well as for drug delivery applications. The use of a gas combined with a biocompatible solvent enables microparticles to be fabricated without contacting toxic compounds, thereby making them more attractive for medical applications.

Conference Abstracts and papers

1. Abreu E, Bellare A "Network parameters of UHMWPE before and after gamma radiation" *Trans 9th World Biomaterials Congress*, Chengdu, China, 2012

2. Sun DC, Brooks D, Allen M, Lin S, Tsay R, Bellare A "Optimization for Oxidation Resistance, Material Strength and Weight in Highly crosslinked UHMWPE" *Trans 9th World Biomaterials Congress*, Chengdu, China 2012

3. Fan CE, Halperin J, Bellare A "The Effect of High crystallinity on Tensile Properties of VitamiN E stabilized Irradiated Polyethylene" *Trans ORS* Vol 38, p45, 2013

4. George A, Ngo H, Bellare A "A method to mitigate the loss in tensile properties of irradiated Vitamin E blended UHMWPE" *Trans ORS*, p 1056, 2013

5. Sun DC, Lin S, Brooks D, Allen M, Tsay R, Bellare A, Higham P "Evaluation of highly crosslinked UHMWPE by an universal performance index" *Trans ORS*, p1816, 2013

6. Stamer J, Halperin A, George A, Bellare A "The effect of Vitamin E content on the tensile properties of irradiated Vitamin E blended UHMWPE" *Trans ORS*, p1826, 2013

7. Ngo H, Hufen J, Walkenhorst R, Bellare A "The efficacy of Vitamin E and a hindered light amine stabilizer in stabilizing UHMWPE from oxidation" Trans Soc Biomaterials, p316, 2013, Boston, MA

8. Bellare A, Le K-P, Yau S-S, Spiegelberg S "Macromolecular and morphological characterization of medical grade PEEK polymers" *Ist International PEEK meeting*, 2013, Philadelphia, PA

9. Abreu E, Ngo HD, Bellare A "Characterization of network parameters for UHMWPE by plane strain compression" under review, *J Mechanical Behavior of Biomedical Materials.*

10. Fabio D'Angelo, Ngo HD, Bellare, "Abrasive wear behavior of irradiated UHMWPE containing Vitamin E" under review, *J Appl Polym Sci*

Optical Coherent Tomography Program: Dr. Mark Brezinski

Our program has advanced significantly, particularly since the addition of **Valerie Jordan** to the department. Advances can be divided into clinical/bench work, technology advancement, and education. These areas have progressed both through conventional channels as well as exploiting the power of social networking and communication technology.

Clinical/Bench work

This area can be divided into our human arthroscopic studies, rotator cuff work (in animals and humans), animal models of RA, and quantum biology.

1. The in vivo arthroscopic study is the highest impact clinical work. OCT imaging was obtained of knee cartilage arthroscopically, as well as MRIs and conventional arthroscopies. The major point of interest in the study was areas abnormal by OCT but normal by the other modalities, which were then reimaged by MRI after three years. The year 0 data is published, and the last year 3 MRIs will be done by the end of this month. Preliminary data suggested areas abnormal by OCT (but normal by the other modalities) progressed to OA but it awaits final analysis. A limitation of this trial was that neither Scott nor I are clinical scientists, and Dr. Katz was over-committed, so it took 7 rather than 4 years. To pursue another clinical trial, the

logical extension, we would need a clinical scientist (of Dr. Katz's caliber) or hire a private company to run it.

2. We have done both human and animal rotator cuff imaging (of the repair). It has become clear that the repair contains only contains scar tissue. The direction of this research is tissue engineering, with our focus on OCT guidance of tissue engineering models. While these animal models were funded by the NIH in the past and are part of their mission statement, the reorganization has left these types of studies without a review committee. Therefore, we are actively looking for a tissue-engineering collaborator as the next logical step for this work on combining an OCT-imaging animal model with a specific therapy.

3. The mice RA work is done in collaboration with Dr. Brenner, and I can expand on it if needed.

4. Quantum biology is an active area for us; quantum processes that affect physiology. Prior examples from other groups are photosynthesis and magnetoreception. Our interest is in non-local communication between inflammatory cells, which has many applications in musculoskeletal diseases. It also is potentially relevant to tissue engineering, but this is not an area we have actively pursued. We have three publications on the topic and the fourth, which is the most critical, is submitted.

Technology

We have four provisional patents in the last three years, with three being related to improved performance. More relevant to the magazine would be our work on OCT adjuvant techniques (approaches beyond structural imaging). These include second order correlations (SOC) OCT for lipid or GAG concentration, polarization sensitive OCT for collagen organization and concentration, and OCT elastography for non-contact tissue stress measurements. The elastogarphy approach we have yet to file for patent protection. The SOC OCT is of particular importance, because besides being a new source of funding, it is a paradigm shift using quantum principles with conventional OCT.

Education

You probably know we have a very high success rate of getting team members into careers they desire. Both Chris's are leaving the lab this summer, one to medical school and one to an orthopedics residency. We use what 8 years ago was considered an unorthodox training method, but is now becoming more orthodox, as our group will be featured in BWH magazine on this education issue. I can expand upon it if needed, but the article should be out shortly. Basically, rather than having lab meetings with their inherent inefficiencies, team members are given devices (ex; iPods) with lectures they can listen to when they are most receptive. Then they respond to or ask questions on the work. The focus is on what the world is currently demanding: brevity, simplicity, and self-learning.

Social Networking

We have been using social networking for years and continue to advance in this area to promote our work. We have numerous websites up (and are expanding), including OCTorthopedics.com, which is under construction. More importantly, we are well positioned with search engine optimization (SEO) and web analytics to continue expanding the exposure of our work. An additional example is that each paper published is announced on websites such as Linkedin, OCT-News, etc., which gives us much more visibility than traditional methods only.

Clinical

Clinically, Mark continues his interests in preventing patient joint injury and maintaining functionality with aging, focused on the knees, back, neck, and shoulders.

DR.S THOMAS THORNHILL AND RICHARD SCOTT, Celebration of Dick's 38 years at BWH Orthopedics

Alumni News

After 38 years at the Robert Breck Brigham in the Brigham and Women's Hospital, **Dick Scott** has made a gradual move towards retirement. He has now consolidated his surgery at the New England Baptist Hospital and while he attends many of our academic conferences, he is no longer actively operating at the Brigham and Women's. Dick's tenure and the legacy he has left our department will always be remembered. We had a nice celebration for Dick attended by most of our staff, **Fred Ewald** and his wife Sarah were there. Dickie Thomas, Bill Thomas's widow was there. Bob and Anita Poss. could not make it, but sent their regrets. Iit was a wonderful evening reminiscing on Dick's many successes.

News from **Clem Sledge** comes mainly via Bob Poss Clem and Georgia spend their time in Maine and in Marblehead. Unfortunately, I have not had a chance to visit with him in a long time.

Many of you will remember the **William H. Thomas Award** which we started 17 years ago to honor, in Bill's name, the PGY5 who best exemplified Dedication, Collegiality, and Excellent Patient Care during their tenure as a resident. The past winners, many in our group have gone on to great careers. This year's winner was **Dr. Eric Black**. This traditionally had been BWH centric but, thanks to the generosity of **Dickie Thomas** the award is now from an endowment in perpetuity and is selected by all attendings at HCORP who have resident contact.

Summary

In summary, brevity is always a positive. My plans after my tenure as chief is to continue to operate, support the new Chair if he/she wishes and I would welcome any comments or suggestions and look forward to seeing each of you at our alumni this next academy.