ANDERSON ORTHOPAEDIC RESEARCH INSTITUTE

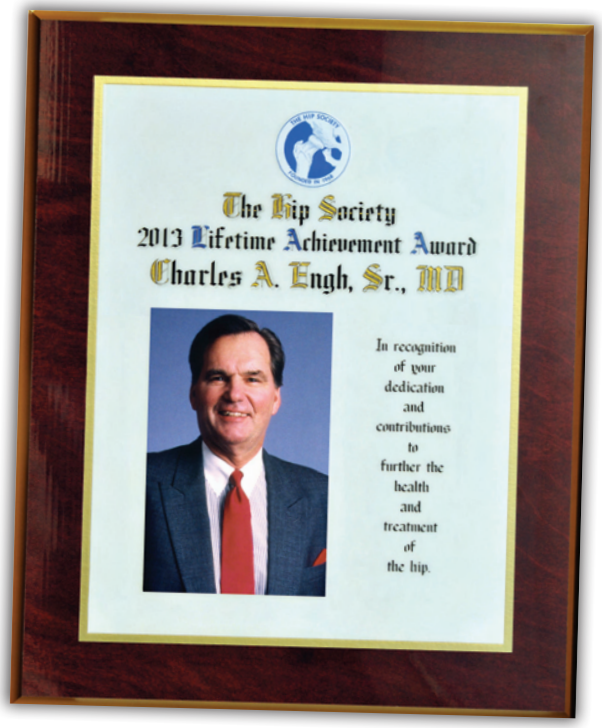
40th Anniversary

JOINT JOURNAL

VOLUME 22 FALL/WINTER 2013

Dr. Charles Recognized with Lifetime Achievement Award

Dad's scientific research was inspired by his genuine concern for the people he treated. He always wanted to give them the best care possible. - Dr. Andy Engh



Capping off his illustrious professional career, Dr. Charles Engh joined an elite group of orthopaedic surgeons at the Hip Society Meeting held on the final day of the 2013 American Academy of Orthopaedic Surgeons conference in Chicago, Illinois. At the meeting, Dr. Dave Lewallen, the current president of the Hip Society, presented Dr. Charles with the Society's Lifetime Achievement Award. Founded in 1968, the Hip Society had presented Lifetime Achievement Awards to only three other orthopaedic surgeons when Dr. Charles was honored.

In his introduction, Dr. Lewallen recalled how Dr. Charles' contributions to orthopaedics have changed the way that hip replacements are done around the world. Just as importantly, he also reflected on how Dr. Charles would mentor young orthopaedic surgeons, making them feel comfortable and always taking time to answer their questions.

Following Dr. Lewallen's introduction, Dr. Andy Engh offered his own tribute to his father's achievements, fondly recalling the two decades that he spent working alongside him. Recognizing that implant fixation with cement was the gold standard when his father began doing hip replacements, Dr. Andy described how his father meticulously collected outcome data on all his patients. He also collaborated on research projects with colleagues who embraced

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Award-Winning Research

Congratulations! An AORI study, led by principal investigator Dr. Bill Hamilton, has won a prestigious research award. The award was granted by the Orthopaedic Research and Education Foundation for Current Concepts in Joint Replacement. That organization provides continuing medical education for members of the orthopaedic health care profession. Dr. Hamilton's study on the use of patient-specific instruments for total knee arthroplasty was chosen from a number of submissions focusing on health care policy, clinical outcomes, and translational research for having immediate clinical impact in the diagnosis and treatment of patients. An honorarium of $2,000 in recognition of scientific achievement and clinical relevance was awarded.

The purpose of the study was to determine if patient-specific instruments (PSI) for total knee arthroplasty shortened surgical time, used fewer instruments, or improved leg alignment compared to traditional instrumentation. The new instruments are made to fit exactly on the patient's bones based on a CT image taken weeks before surgery. The image is used to manufacture a cutting guide, made just for that patient. The potential improvements are related to the efficiency and accuracy of performing knee surgery. As new techniques, implants, and instruments become available, AORI strives to evaluate these new technologies with well-designed, prospective, randomized studies.

Dr. Hamilton's co-authors included Dr. Arjun Saxena, an Anderson Fellow, and Nancy Parks of AORI who helped to design the study, recorded data on the timing of the surgical steps, and painstakingly measured knee x-rays to evaluate implant position. After analyzing all the data, they found that the patient-specific instruments were not significantly better than the traditional instruments. As with so many "new and improved" products that are offered every day, PSI was no worse than the traditional instruments, but in terms of surgical time and knee alignment, they were also no better. This may be related to the fact that Dr. Hamilton is so experienced with the traditional instruments – he already uses them very accurately and efficiently.

Dr. Bill Hamilton and Nancy Parks with the award they received for their research on patient-specific instrumentation.

One of the significant differences between the PSI and traditional instruments was the number of "trays" that were needed in the operating room. Trays are metal bins that hold all the tools and devices that might be needed for any operation. They are specially sterilized and laid out on tables in the room for each surgery. There are normally at least 7 trays of instruments used for a total knee surgery, but with the PSI, only 2 trays were needed. This is because all the planning and sizing was done before the surgery began, by using the CT scan.

The results of the study were first presented at the American Association of Hip and Knee Surgeons Annual Meeting at the end of 2012. In conjunction with his award, Dr. Hamilton also presented the study at the 2013 Current Concepts in Joint Replacement Meeting in Las Vegas, which attracts an international audience of over 20,000 orthopaedic surgeons – one of the largest meetings focusing on joint arthroplasty. Talk about being in the spotlight!

2013 Research Highlights

In this issue of the *Joint Journal*, we highlight the scientific studies published during 2013 that describe the ongoing research at the Anderson Orthopaedic Research Institute (AORI) and the collaborative studies that we are pursuing with other centers. Like many aspects of modern society, the world of hip and knee orthopaedics is rapidly evolving and continues to produce new operative and clinical procedures, implant designs and materials. At the same time, we need to have both technologically sophisticated and clinically practical methods to evaluate outcome so that we can determine the best ways to treat patients now and in the future. With these goals in mind, AORI constantly seeks to evaluate new technologies while tracking the outcome of all joint replacements performed at the Anderson Orthopaedic Institute. We hope this research review gives our readers insight regarding the contemporary issues and developments in the field of joint replacement, underscoring how carefully designed clinical studies and routine monitoring of all patients via our database can provide surgeons and patients with essential information to evaluate the effectiveness of implants and procedures.

Unicondylar Knee Replacement

When Dr. Jerry Engh evaluates a patient for knee replacement surgery, his philosophy is to preserve as much of the patient's healthy joint as possible. When the arthritis does not involve the entire knee, he frequently replaces only one part of the knee joint with a unicondylar (uni) implant instead of replacing the entire joint with a total knee replacement. In a recently published study (A), Dr. Jerry's uni patients who did not have a history of instability in their knee but were missing their Anterior Cruciate Ligament (ACL) at the time of surgery were compared to another group of his uni patients with intact ACLs. Among these patients, there was no difference in the revision rates between the knees without an ACL and those with an intact ACL. For Dr. Jerry, the results lend support to the idea that a patient without an ACL can still be a candidate for a uni as long as their knee is stable.

A. Engh GA, Ammeen DJ. **Unicondylar Arthroplasty in ACL-Deficient Knees**. *Clinical Orthopaedics and Related Research*. Electronically published April 10, 2013.

Hip and Knee Outcome Among Young, Active Patients

In a collaborative study with the Washington University in St. Louis and several other joint replacement centers, a comprehensive phone survey was used to evaluate the outcome of young, active joint replacement patients. For those with hip replacements, patients who had received a surface replacement reported higher levels of function with fewer symptoms and less perception of limb length discrepancy compared to patients who had received a total joint replacement (B). Among knee replacement patients, the survey found that most (89%) were able to return to work at their usual occupation (C) although about one-third reported residual symptoms and limitations (D). Socioeconomic factors, and income in particular, were also found to be more strongly associated with satisfaction and functional outcomes than patient or implant factors (E). This finding suggests that socioeconomic status should be considered when evaluating outcome after knee replacement.

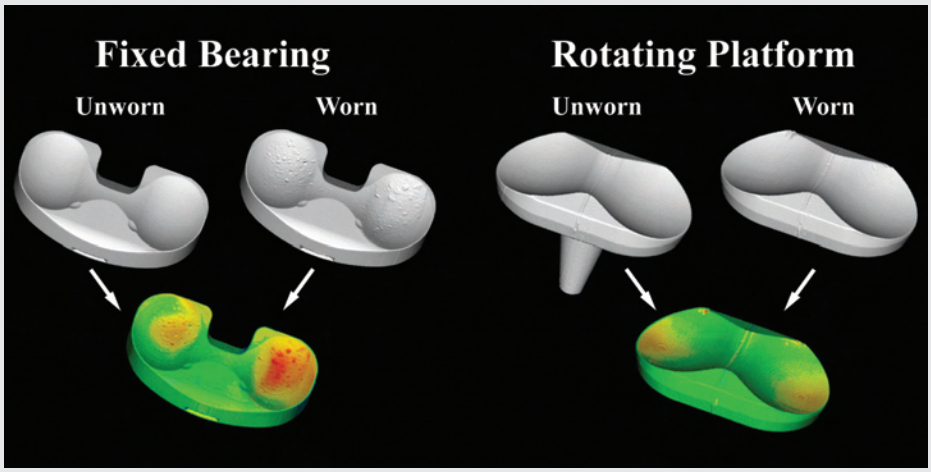
B. Barrack RL, Ruh EL, Berend ME, Della Valle CJ, Engh CA Jr, Parvizi J, Clohisy JC, Nunley RM. **Do Young, Active Patients Perceive Advantages After Surface Replacement Compared to Cementless Total Hip Arthroplasty?** *Clinical Orthopaedics and Related Research*. Electronically published March 19, 2013.

C. Lombardi AV Jr, Nunley RM, Berend KR, Ruh EL, Clohisy JC, Hamilton WG, Della Valle CJ, Parvizi J, Barrack RL. **Do Patients Return to Work After Total Knee Arthroplasty?** *Clinical Orthopaedics and Related Research*. Electronically published June 13, 2013.

Using Advanced Imaging to Measure Knee Wear

Culminating several years of research work, AORI published the results of a study* that used high resolution micro-computed tomography (microCT) images to accurately measure the volume of polyethylene wear from retrieved knee replacements. In the past, investigators often weighed retrieved parts to determine the total amount of material that had been lost but could not tell exactly how much wear had occurred in specific locations. AORI's measurement technique now offers researchers a method to determine the exact location and volume of wear. Applying the method to 24 retrieved polyethylene inserts, AORI found that knee inserts allowed to rotate on a polished metal baseplate (called Rotating Plaform designs) tended to wear less than knee implants that tried to rigidly secure the insert to the baseplate (called Fixed Bearing designs).

*Engh CA Jr, Zimmerman RL, Hopper RH Jr, Engh GA. **Can Microcomputed Tomography Measure Retrieved Polyethylene Wear? Comparing Fixed-Bearing and Rotating-Platform Knees.** *Clinical Orthopaedics and Related Research*. January 2013; 471(1):86-93.



By superimposing 3D reconstructions of worn and unworn inserts using image analysis software, the exact location and volume of wear can be determined. In the figure above, red regions represent the most severe wear and the green regions have no wear.

D. Parvizi J, Nunley RM, Berend KR, Lombardi AV Jr, Ruh EL, Clohisy JC, Hamilton WG, Della Valle CJ, Barrack RL. **High Level of Residual Symptoms in Young Patients After Total Knee Arthroplasty**. *Clinical Orthopaedics and Related Research*. Electronically published September 24, 2013.

E. Barrack RL, Ruh EL, Chen J, Lombardi AV, Berend KR, Parvizi J, Della Valle CJ, Hamilton WG, Nunley RM. **Impact of Socioeconomic Factors on Outcome of Total Knee Arthroplasty**. *Clinical Orthopaedics and Related Research*. Electronically published April 30, 2013.

A Simple Method to Evaluate Functional Improvement after Knee Replacement

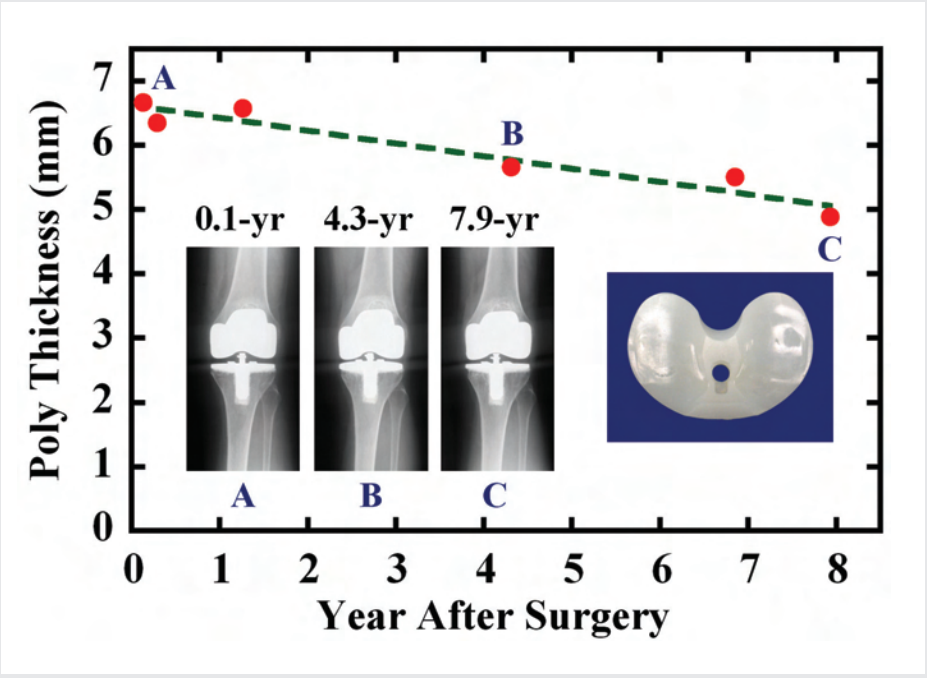
Questionnaires completed by doctors or patients are the most common way that researchers try to evaluate the outcome of joint replacements. The information is definitely valuable but it's difficult to objectively compare the level of function among different patients. To better evaluate function, Dr. Jerry designed a simple clinical method that he calls the Functional Assessment Test. The test measures the amount of time it takes a person to rise from a chair, walk 30 feet, ascend and descend a short flight of stairs, then walk back to the chair and sit down. Working with AORI, Dr. Jerry found that the Functional Assessment test takes less than a minute to complete and is practical to use in a clinical setting as a simple means to quantify function before and after knee arthroplasty (F).

F. Engh GA, Sheridan MJ, Ammeen DJ. **The Functional Assessment Test: A Method of Evaluating Improvement in Function After Knee Arthroplasty**. *Journal of Arthroplasty*. Electronically published July 31, 2013.

A Clinically Practical Method to Measure Knee Wear

Because hip replacements have relatively simple ball-in-socket designs, there are many techniques to measure implant wear. The more complex design and motion of knee replacements makes measuring wear more challenging and only a few methods are currently available. Some of these methods are quite complex and it would be useful for doctors to have a simple technique that could be used to measure wear from x-rays. By analyzing 2,131 x-rays from 251 knee replacement patients, AORI found that knee wear can be measured quite reliably when carefully-controlled x-rays are obtained at routine follow-up visits. AORI's research* found that most (92%) knee replacements wear at a constant rate over the life of the implant. The average linear wear rate of 0.09 millimeters per year (mm/yr) for knees was also quite close to the 0.1 mm/yr rate historically reported for many hip replacements. Like hips, higher knee wear rates were associated with higher revision rates so measuring knee wear during follow-up may be a good indicator of whether or not a patient will need a revision in the future.

*Engh CA Jr, Collier MB, Hopper RH Jr, Hatten KM, Engh GA. **Radiographically Measured Total Knee Wear is Constant and Predicts Failure.** *Journal of Arthroplasty*. September 2013; 28(8):1338-44.



Using AORI's measurement method, polyethylene insert thickness measurements (designated by the red circles) are plotted versus time. Some of the x-rays used for the thickness measurements are illustrated on the left side. For this case, the insert wore at a constant rate 0.20 mm/yr and the patient had a revision for osteolysis 8.2 years after surgery. The worn insert that was retrieved at the time of the revision is shown on the right side.

Comparing Knee Revision Methods for Infection

Infections are among the most devastating complications that joint replacement patients encounter. While infections are relatively rare, the way to fix a knee implant after the infection has been eliminated is controversial. In a collaborative research effort with orthopaedic surgeons in Charlotte, North Carolina, the outcome of knee implants with cemented stems was compared to implants with stems that were press-fit without cement (G). Although the rates of reinfection and revision for aseptic loosening were similar, the cementless stems appeared to be better fixed on x-rays. Although the conflict is not resolved, the evidence shows that cementless stems are an option that should be considered when re-implanting a knee replacement after infection.

G. Edwards PK, Fehring TK, Hamilton WG, Perricelli B, Beaver WB, Odum SM. **Are Cementless Stems More Durable Than Cemented Stems in Two-stage Revisions of Infected Total Knee Arthroplasties?** *Clinical Orthopaedics and Related Research*. Electronically published July 2, 2013.

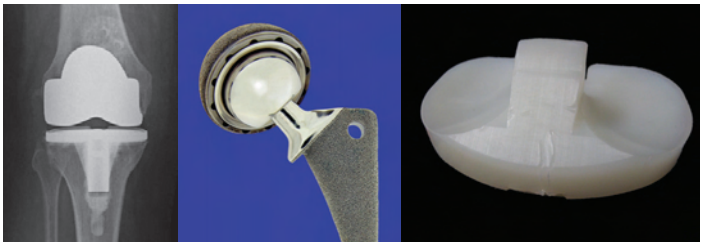
Thanks for Your Support

As we reflect on the past year, all of us at AORI wish to express our gratitude to those who have supported our research efforts. Each donation that we receive enables us to undertake research that helps improve the quality of life for individuals who suffer from hip and knee arthritis.

Your donation and bequests go towards:

- The scientific assessment of new and existing implant systems
- The development of improved diagnostic methods
- The detection of unusual complications
- The evaluation of new surgical procedures
- The overall improvement of joint replacements

If you donated to AORI between April 1, 2012 and October 31, 2013 and are not listed below, we apologize. Please contact Susan Sensi at (703) 619-4411 or email research@aori.org so that we can correct our mistake. It is important to us to recognize all of our supporters in the *Joint Journal*.



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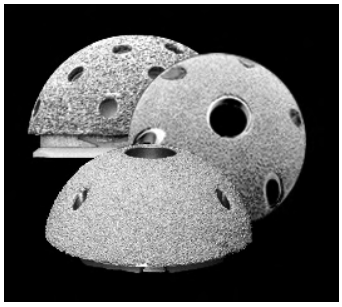

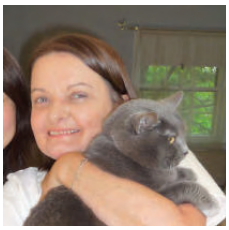

Jacquie Barker: Bionic Woman

Jacquie Barker is a youthful 56 year old woman with an active lifestyle; when she's not engaged in her career as a software engineer or pursuing her passion as an animal rescue volunteer, she's often found enjoying tandem bicycling or motorcycle rides in the Virginia countryside with her husband Steve.

Her active lifestyle came to an abrupt halt in the spring of 2006, when a simple twist of her leg led to a "pop" … then swelling … then debilitating knee pain. The initial diagnosis -- a torn meniscus -- led to the subsequent discovery that the cartilage lining her right knee was badly and prematurely damaged by osteoarthritis. "At the age of 50, I had the knee of a 70 year old," Jacquie acknowledges.

She consulted numerous physicians and surgeons, hoping to find a solution that wouldn't involve major surgery, but was ultimately convinced that joint replacement was the best option. Seeking referrals from physicians, colleagues, and friends, all paths pointed to the Anderson Clinic, and in particular, to Dr. Gerard Engh (affectionately known as "Dr. Jerry" by his many admirers: patients, colleagues, staff).

Jacquie underwent partial knee replacement surgery with Dr. Jerry in April 2008, performed at Inova Mount Vernon Hospital. "I felt so well cared for while at the hospital that I was actually disappointed to be discharged the next day," says Jacquie.

Within a month of surgery, Jacquie was able to resume most of her day-to-day activities; within three months of surgery, she was thrilled to be fully recovered and back to her pre-injury lifestyle.

In the winter of 2011, her other (left) knee started to fail due to osteoarthritis; the second time around, there was no hesitation! Jacquie made an appointment with Dr. Jerry, received confirmation from him that partial knee replacement was the right approach for her left knee as well, and scheduled surgery soon thereafter.

Jacquie writes: "I feel like the 'bionic woman' – I couldn't be happier with the outcome, and I'm delighted to have found Dr. Jerry! Whenever I encounter anyone who is suffering from knee issues similar to mine, I happily refer them to The Anderson Clinic and to Dr. Jerry in particular."

Jacquie would be happy to share her experiences with other patients who are contemplating partial knee replacement surgery; she can be reached via email at jacquie@petsbringjoy.org (and would love for you to visit the petsbringjoy.org website as well. :o)

Celebrating Pain Free Mobility to Help Others

The commitment to invest in research and educate doctors to improve joint replacement outcomes began long before my 1995 accident by AORI, Dr. Charles, and other amazing surgeons, it's now our time to pay it forward for others in the future.

- John Schanz

John Schanz has always had a passion for education. In his own life, that passion led him to pursue an electrical engineering degree from Manhattan College and a career in technology. With over 27 years of technical and business leadership experience in global telecommunications services, John currently serves as the Executive Vice President and Chief Network Officer for Comcast Cable. Recognizing the importance of education, John has also invested himself in several charities dedicated to research and education. Among his many commitments, John currently serves on AORI's Board of Trustees. At the age of 49, John is among AORI's youngest trustees and the course of events that led him to become an advocate for joint replacement research and education is both tragic and inspiring.

At the age of 31, John's life took an unexpected turn while he was waterskiing during the summer of 1995. A freak fall resulted in a complex hip fracture that required open reduction and internal fixation. Although his surgeons did their best to reconstruct his joint, they also told John that he would eventually require a hip replacement. With limited motion and progressively increasing hip pain, John met with several surgeons over the next few years and visited Dr. Charles Engh in July of 1999. As a young man of only 35, John knew he needed a durable implant. Fortunately, Dr. Charles had pioneered the use of porous-coated hip replacements using bone ingrowth in the late 1970s and had been tracking the outcome of his patients for over two decades. At the time he saw John, Dr. Charles' research experience with AORI proved that implant fixation via bone ingrowth was particularly well-suited for young patients who wanted to return to an active lifestyle.

To train for his Mount Kilimanjaro climb, John Schanz spent time hiking Pike's Peak in Colorado Springs during the summer of 2013.

On September 1, 1999, John had his hip replaced using porous-coated components that Dr. Charles had developed. He also received a new type of crosslinked polyethylene that had only recently become available in January of 1999. Prior to the introduction of crosslinked polyethylene, wear and bone loss (called osteolysis) were the biggest long-term threats to the success of a hip replacement. As it does with many new technologies, AORI was conducting a study to compare the performance of crosslinked polyethylene with conventional liners when John had his surgery. At 10-year follow-up, AORI's study found very low wear and no clinically important osteolysis with

See Celebrating Pain Free Mobility, page 11

AORI Welcomes International Research Fellow

On September 10, 2013, AORI welcomed Dr. Phonthakorn (Paul) Panichkul as AORI's International Research Fellow. Prior to coming to AORI, Paul completed his orthopaedic residency in Thailand in 2011. He subsequently completed clinical and research fellowships in adult joint reconstruction at Thammasat University Hospital in 2012 and 2013. Having already won awards for his orthopaedic research in Thailand and published several papers in prominent journals, we are excited that Paul will be bringing his international experience to AORI.

My goal is to learn the best research and clinical practices in the world so that I can take them back to serve the people of Thailand.

- Dr. Paul Panichkul

Dr. Paul Panichkul will be working with Dr. Andy Engh during his fellowship at AORI.

During his 10 month research fellowship, Paul will devote his efforts to AORI's ongoing research work led by Dr. Andy Engh and Dr. Bill Hamilton. After completing his fellowship at AORI, Paul will be heading to the London Health Sciences Centre in Ontario, Canada for one year and then to the Mayo Clinic in Rochester, Minnesota for a final fellowship year before he returns to Thailand. We wish Paul and his wife the best during their stay in North America.

AORI Surgeons Recognized as Emerging Leaders in Orthopaedics

At the 2013 American Academy of Orthopaedic Surgeons Annual Meeting, Dr. Kevin Fricka and Dr. Bill Hamilton were among the surgeons recognized by *Orthopedics Today* and DePuy Synthes Joint Reconstruction as emerging leaders in orthopaedics. They were selected from board-certified orthopaedic surgeons with 5 to 10 years of training who were recognized by their peers as skilled joint replacement surgeons and innovators in orthopaedic surgical processes and concepts. Criteria for recognition included research work, leadership in the joint replacement community, teaching ability and giving back to society.

Lifetime Achievement Award continued from page 1

the concept of biologic fixation via bone ingrowth as well as those who doubted its effectiveness. Over the years, Dr. Charles' objective, scientific research coupled with his humble honesty changed the way that hip replacements were done in North America and around the world.

Just as important as his research, Dr. Andy also recalled how his father trained more than 100 fellows over the course of 30 years. These surgeons typically came to the Anderson Orthopaedic Institute to refine their operating skills but always left with firsthand knowledge about the importance of knowing and understanding their patients. As his patients often relate, everyone always knew that Dr. Charles cared about his patients as people, not just about their hip replacements.

As Dr. Charles walked to the podium to accept the award, the entire audience offered him a standing ovation. Together with his professional colleagues, everyone at AORI offers Dr. Charles our heartfelt congratulations and renewed wishes for a wonderful and well-deserved retirement. In his honor, AORI aspires to continue the research efforts that he initiated so that we can offer objective scientific answers to the clinical questions that patients confront every day.

Dr. Andy celebrates his father's Lifetime Achievement Award.

Do you have a story that you would like to share with the readers of the Joint Journal? Please contact Susan Sensi at (703) 619-4411 or email research@aori.org

Celebrating Pain Free Mobility continued from page 9

crosslinked liners. Like the patients in AORI's study, we are pleased to report that John had no evidence of wear or osteolysis when he last returned for follow-up more than 10 years after his hip replacement.

As he approaches his 50th birthday in February of 2014, John is planning to climb Africa's Mount Kilimanjaro to celebrate the pain-free mobility that he now enjoys. But to make his "Johnamanjaro" climb more than just a personal accomplishment, John will also be using the event to raise funds for the educational charities that he supports.

If you would like to show your support for John's climb, please check the "I support Johnamanjaro" box on the envelope enclosed with this newsletter. If you check the "I support Johnamanjaro" box and also enclose a donation to AORI, John will match a portion of your donation, up to a total of $50,000 to be allocated to AORI and four other educational charities that John supports. You can also donate to AORI using the PayPal donation link found on the bottom right at www.aori.org. After you enter your donation amount and log in to PayPal, please click on the "Instructions/Designation (optional)" section and enter "Johnamanjaro" before finalizing your donation. Or you can even go directly to www.johnamanjaro.org and select AORI while making an electronic donation.

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*The **Joint Journal** is published by Drs. C. Engh, G. Engh, C. Anderson Engh, K. Fricka, W. Hamilton, and N. Goyal for the friends of the Anderson Orthopaedic Research Institute (AORI). Its contents are not intended as a substitute for medical advice.*

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