The Institute is dedicated to keeping people of all ages physically active through orthopaedic research and education in the areas of arthritis, healing, rehabilitation, and injury.

Founded in 1988 by orthopaedic surgeon Dr. J. Richard Steadman, the Steadman Philippon Research Institute is an independent, tax-exempt (IRS code 501(c)(3)) charitable organization employing scientists, researchers, fellows, visiting scholars, and interns. Dr. Steadman moved to Vail in 1990 with one researcher. Today, there are almost 30 employees (scientists, researchers, medical fellows, visiting scholars, administration, and interns). In 2010, Dr. Marc Philippon’s name was added to mark the succession of the Institute and recognize his research efforts and contributions to the field of hip arthroscopy.

Funding for research and education programs comes primarily from public donations and fundraising events (grateful patients and the physicians of The Steadman Clinic), corporations, and competitive grants.

The Institute wishes to express again deep appreciation to John P. Kelly, who donated many of the stock photos in this year’s Annual Report and contributed his time to photograph the many Institute and operating room subjects.

John Kelly first picked up a camera while serving as an infantry lieutenant in the Air Cavalry in Vietnam. He quickly developed a love for photography that he took home with him to Colorado. By combining his new craft with his passion for sports and adventure, Kelly created a successful career.

His diverse photo assignments have taken him from Wimbledon to trekking the Himalayas, the Winter Olympics to sailing the Caribbean. He was the official photographer for the U.S. Open Golf Championships for 10 years, and the only American among the official photographers at the Lillehammer Winter Olympic Games. When Robert Redford needed the defining shot to promote his film “A River Runs Through It,” he called on Kelly. Subsequently, Kelly also provided the still photography for Redford’s “The Horse Whisperer.”

Although he has traveled all over the world, many of his favorite photo shoots have taken place at his beloved End of the Road Ranch in western Colorado, where clients such as Polo/Ralph Lauren have come to work and play with Kelly and his friends and animals.
The Institute is known throughout the world for its research into the causes, prevention, and treatment of orthopaedic disorders. We are committed to solving orthopaedic problems that limit an individual’s ability to maintain an active life.

Our research perspective is based on clinical relevance, with a goal of improving the care of the patient. Recognizing that the body’s innate healing powers can be harnessed and manipulated to improve the healing process has led to exciting advances in surgical techniques developed by Dr. Richard Steadman and validated at our Institute. Today, the Institute is recognized worldwide for Dr. Marc Philippon’s pioneering research in the treatment of sports-related injuries to the hip.

Athletes are becoming bigger, faster, and stronger. Unfortunately, their connective tissue does not. Therefore, injuries are becoming more complex. Our research into the anatomy and mechanisms of the complex knee, hip, and shoulder is being recognized worldwide.

We collect data and publish clinical research results on knees, hips, shoulders, spines, feet and ankles, and hands and wrists, and work to improve imaging techniques. Through these efforts, SPRI has become one of the most published and innovative organizations in sports medicine research and education. We publish our findings in relevant peer-reviewed scientific and medical journals, and present our research results at medical meetings worldwide.

Philanthropic gifts are used to advance scientific research and to support scholarly academic programs that train physicians for the future. Through our fellowship and visiting scholar programs, the Institute has now built a network of more than 200 fellows and visiting scholars worldwide who share the advanced ideas and communicate the concepts they learned in Vail to their patient base.

OUR PRIMARY AREAS OF RESEARCH AND EDUCATION ARE:

- **Department of BioMedical Engineering** – advances patient care by focusing on injury mechanisms and prevention, develops and validates novel surgical treatments and rehabilitation techniques, and teaches advanced research protocols using state-of-the-art biomedical research techniques and technologies.

- **Center for Outcomes-Based Orthopaedic Research** – conducts evidence- or outcomes-based research using actual clinical data that aids both physicians and patients in making better and more informed treatment decisions.

- **Center for Translational and Regenerative Medicine Research** – undertakes biological studies at the cellular level to investigate the causes and effects of degenerative arthritis, techniques of cartilage regeneration, and basic biological healing processes.

- **Imaging Research** – develops and evaluates noninvasive imaging techniques of the joints for the purpose of directing and monitoring clinical treatment and outcomes, and to enhance the clinical relevance of biomechanics research.

- **Surgical Skills Laboratory** – implements new surgical technologies and trains surgeons in new techniques using state-of-the-art equipment.

- **Education and Fellowship Program** – administers and coordinates the physicians-in-residence fellowships and visiting scholars programs, hosts conferences and international medical meetings, produces and distributes publications and educational media, and organizes educational outreach programs in partnership with the local school district.
DEAR FRIENDS,

On behalf of all of us at the Steadman Philippon Research Institute, we wish to thank you for your continued support, which helped to make 2013 a year of accomplishment and significant international recognition. Your commitment makes it possible for us to carry out our mission of “Keeping People Active” and educating the worldwide orthopaedic community.

Philanthropy from patients, grateful families, and others who have benefitted from our work has been the basis for all our advances since SPRI’s founding in 1988. SPRI’s regenerative medicine and biomedical engineering research on the anatomy and mechanisms of knees, hips, spines, shoulders, and ankles—and the outcomes-based orthopaedic therapies they have yielded—are now recognized worldwide.

Because of the commitment from our many donors, your team at SPRI has been recognized internationally at the highest levels for the quality and excellence in research. In July 2014, the Steadman Philippon Research Institute received the 2014 Excellence in Research Award from the American Orthopaedic Society for Sports Medicine (pg. 12), a world leader in sports medicine education and research, during their annual meeting in Seattle. This is the first time that this award has been won by the Institute since the award was established. The award is presented for the best paper submitted in any category.

Since the opening of the new BioMedical Engineering Laboratories in 2011, two fellowship classes have had the opportunity to perform quality research benefitting patients worldwide. Each of these two fellowship classes has won major international awards.

Earlier in 2013, Dr. Jeff Padalecki, one of our 2011-2012 SPRI fellows, was presented with the Albert Trillat Young Investigator’s Award by the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine at its biennial congress. This award recognizes his research team’s contributions to the understanding, care, and prevention of injuries to the knee.

Dr. Jeff Neppe, a 2012-2013 fellow, was honored in October of 2013 in Munich, Germany, with an important international award presented by the International Society for Hip Arthroscopy (pg. 13) at its annual scientific meeting. The Richard N. Villar Trainee Excellence in Clinical Research Award was presented to Dr. Neppe for his research titled, “The Effect of an Acetabular Labral Tear, Repair, Resection, and Reconstruction on the Hip Fluid Seal.” This award was created to recognize young researchers who contribute high-quality research and information.

In July 2014, the United States Olympic Committee designated us as one of only two U.S. Olympic National Medical Centers in the country. That is quite an honor and one that we take very seriously. The USOC would not have bestowed that honor, the Olympic Rings, and the National Medical Center emblem without The Steadman Clinic and the Steadman Philippon Research Institute being mentioned side-by-side. The U.S. Olympic Committee makes it clear that these two entities—The Clinic and SPRI—are essentially important as a team.

Looking forward, we have submitted our application to the International Olympic Committee to become the first U.S.-based research center for the IOC. That designation would be another significant honor and is
something about which we are very hopeful. The IOC is very interested in basic research regarding all athletes’ health, injury prevention, and improved performance.

For more than 25 years, the Steadman Philippon Research Institute has devoted time and resources to the training and education of physicians and scientists from all over the world. SPRI staff members have been involved in the Vail Valley community since the Institute moved to Vail in 1990. On page 62, you will read about a new level of commitment achieved when the Institute’s Education and Public Outreach Committee—EPOC—began a program to inspire elementary, middle, and high school students in Eagle County to become more involved in the fields of science, technology, engineering, and mathematics. During the 2013–2014 school year, EPOC’s program involved more than 500 students from local schools, beginning with those in the fifth grade.

Our life-changing research would not exist without the visionary support of individuals like you. On behalf of our dedicated trustees and researchers, we wish to thank you, our donors, corporate sponsors, and foundations, for your commitment. We look forward to your continued support and to updating you on exciting advances from the Steadman Philippon Research Institute.

With your help, we are able to make a difference.

Respectfully yours,

J. Richard Steadman, M.D.
Co-Chairman
Co-Chief Scientific Officer

Marc J. Philippon, M.D.
Co-Chairman
Co-Chief Scientific Officer

Gary A. Peterson
President and Chief Executive Officer
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Monica White, CPA, CGMA  
Controller/Treasurer
It started with a house call, but not your typical house call. When Damaris Skouras, a long-time SPRI Board member, learned that Dr. Richard Steadman would be speaking at a conference in Rio de Janeiro, Ms. Skouras asked Jorge Paulo Lemann if he would like to meet Dr. Steadman and ask him to check on a knee Mr. Lemann had injured in a skiing accident.

Dr. Steadman agreed and the three of them spent Easter weekend at Mr. Lemann’s home in Angra dos Reis, where the seeds of Mr. Lemann’s vision to recognize the Steadman Philippon Research Institute as an entity that could have an impact in Brazil were planted.

Mr. Lemann’s friend and physician, Dr. Leonardo Metsavaht, had known of Dr. Steadman’s work and was well aware that Steadman’s thinking was clearly ahead of its time. From that first visit, friendships developed and expanded, an idea was born, and that idea resulted in an award and a program: The Jorge Paulo Lemann Mentored Scientific Award, which is given to an outstanding young Brazilian orthopaedic surgeon. The winner of that award participates in the Brazilian Visiting Scholar Program at the Steadman Philippon Research Institute.

In just six years, the award and program have provided advanced training for eight orthopaedic surgeons, produced more than 40 publications in scientific journals, benefitted two research institutes, and had a significant impact on medical practice in two countries.

Jorge Paulo Lemann is one of the world’s most accomplished and successful businessmen, as well as one of the world’s most active philanthropists. Leonardo Metsavaht, M.D., is an internationally respected orthopaedic surgeon and chief scientific officer of the Institute Brazil of Health Technologies, which is the official administrator of the Jorge Paulo Lemann Mentored Scientific Award.

A GREAT DAY

“A year after Dr. Steadman’s house call, the four of us met in Vail, Colorado,” recalls Ms. Skouras. “After Jorge had been checked out by a team of physicians at The Steadman Clinic, he attended a meeting we arranged in which Drs. Steadman, Philippon, Millett, and Rodkey, and other SPRI staff members described the mission, work, and goals of the Research Institute. Dr. Philippon presented a five-year plan to advance knowledge of hip biomechanics and arthroscopy.”

“By the end of that presentation,” says Dr. Metsavaht, “Jorge was impressed with The Clinic and the educational opportunities being provided by SPRI. He looked at me and said, ‘Leo, I am willing to help Dr. Steadman and Dr. Philippon through annual donations. Any idea of how we could make it better?’ ”

“I suggested that we could provide one Brazilian physician/scholar for the SPRI research team every year and that person would be able to return to Brazil and spread this knowledge in our country.”

“And that was it,” says Dr. Metsavaht. “It was a great day.”
SIX YEARS LATER

The Brazilian Visiting Scholar Program is now an ongoing, expanding, and productive initiative. It has brought eight outstanding orthopaedic surgeons to SPRI. They spend one year in Vail, observing and working with SPRI physicians and scientists, conducting research, making presentations, and writing articles for international medical and scientific journals.

The selection process is rigorous, according to Dr. Metsavaht. “Jorge Lemann and Dr. Steadman want to identify good people and competent physicians who are deserving of advanced orthopaedic training. For the past 20 years, Jorge has participated in the selection process of a program that sponsors students who have been accepted to top universities in the U.S., but who can’t afford all of the expenses. My duty is to do the same with the Jorge Paulo Lemann Mentored Scientific Award.”

DEMANDING QUALIFICATIONS

Candidates must meet seven standards before they can be considered as candidates for the award. They must:

1) be highly skilled orthopaedic surgeons
2) be familiar with arthroscopic surgery and biomechanics
3) be fluent in English
4) have written peer-reviewed scientific papers
5) be willing to spend a year away from their homes and jobs
6) have the capability to apply what they learn at SPRI to their daily duties in Brazil
7) be able to spread their knowledge throughout the Brazilian orthopaedic community

THE RESULTS

Former award winners have performed highly technical surgery in towns that previously had no access to advanced medical practices. They have also made presentations, described their research at national and international conferences, published studies, won scientific awards, and participated in Brazilian national scientific events.

“The return to the Brazilian medical and scientific communities has exceeded our expectations,” says Dr. Metsavaht.

MEDICINE, EDUCATION, AND PHILANTHROPY

“Jorge’s vision is on education, not science,” says Dr. Metsavaht. “He believes the most effective way to build a better world is through education because you don’t merely help the person, you offer a network of opportunities. There are other medical exchange programs, but our goal is focused on improving Brazilian orthopaedic education and scientific inquiry. The best way to do that is through scientific research.”
“I met Jorge Paulo Lemann in 2007,” says Leonardo Metsavaht, M.D., M.Sc., C.S.O., a renowned orthopaedic surgeon and researcher in Rio de Janeiro. “He had a skiing accident and had been unable to play tennis for five months. I suggested a conservative treatment protocol and he was able to return to tennis in six weeks. We started playing tennis once a week, which was enough time to see that we had similar core values, and we became friends.”

Mr. Lemann’s interest in tennis, sports medicine, and orthopaedics is not surprising. He was a five-time national tennis champion in Brazil and played on the Davis Cup teams of both Brazil and Switzerland.

“Jorge asked me how we could improve orthopaedics as a whole in Brazil, other than by building another hospital,” recalls Dr. Metsavaht. “We decided to create an institute to improve thinking on medical conditions. It is called the Brazil Institute of Health Technologies (IBTS), a not-for-profit research institution focused on the prevention of orthopaedic injuries and conditions.”

“Today, our main research efforts are 1) identifying predictive factors of injuries in sports and 2) measuring the risks, as well as identifying risk factors, of falls through biomechanics and motion analysis.”

“IBTS has produced meaningful results sooner than we expected. In four years, the Institute has produced high-impact research published in professional journals, and in 2013 it was awarded the top research award by the World Biomechanics Congress.”

“I had been following his state-of-the-art work in researching knee instability. I suggested that we sponsor one scholar in hip and a second in knee biomechanics and arthroscopic surgery.”

After sending award winners and visiting scholars to Vail in 2009, 2010, 2011, and 2012, Mr. Lemann has funded and Dr. Metsavaht has administered the selection process for two scholars in 2013 and two more in 2014.

“His suggestion coincided with the addition of Dr. Robert LaPrade to The Steadman Clinic and the Research Institute. I have the highest regard for Dr. LaPrade because I had been following his state-of-the-art work in researching knee instability. I suggested that we sponsor one scholar in hip and a second in knee biomechanics and arthroscopic surgery.”

Bruno Nogueira, M.D., was an award winner in 2011. About his experience he says, “Being named a Visiting Scholar at Steadman Philippon is the best award I’ve won in my life. I really wanted to go to Vail and SPRI, and couldn’t believe it when I was told I had been accepted into the program. I knew it would allow me to learn from the world’s best sports medicine surgeons and scientists.”

A 2012 Visiting Scholar, Dr. Lourenco Peixoto says, “The Jorge Paul Lemann Mentored Scientific Award was a great and unexpected honor. I’m a much better physician now than I was before my experience at SPRI. Just one year changed my life, and I’m not the only one. I saw others who came to Vail as young doctors and left as experienced practitioners and researchers.”

Damaris Skouras says it best, “On behalf of the SPRI Board of Directors and SPRI community at large, we are deeply grateful to you, Jorge Paulo Lemann, for the results we have achieved for the U.S. and Brazil. Muito obrigado, Jorge Paulo!”
The Steadman Philippon Research Institute has nine physicians, 20 research scientists, and six administrative professionals. Yet this relatively small group continues to position SPRI as one of the most productive institutions in the world as measured by publications, presentations, and awards.

In 2013, SPRI’s doctors and researchers had 58 articles published in scientific and medical journals such as *The American Journal of Sports Medicine*, *the Journal of Orthopaedic Research*, and *the Journal of Bone and Joint Surgery*. Each publication was cited in the National Library of Medicine (PubMed).

More than 40 presentations describing the outcomes of studies conducted at SPRI were made at conferences in the U.S., Europe, Canada, South America, and Africa.

Physicians and scientists at Steadman Philippon were honored by the American Academy of Orthopaedic Surgeons, the International Society for Hip Arthroscopy, and the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine.

**HOW DO THEY DO IT?**

*The answer begins with you.*

“All of our achievements are made possible through the support of generous individual donors and our corporate and institutional friends,” says John McMurtry, M.A., M.B.A., director of Development. “We appreciate that support, which has helped SPRI’s vision become a reality.”

**INTANGIBLES**

Dr. William Rodkey, D.V.M., director of SPRI’s Center for Translational and Regenerative Medicine Research, adds that two intangible factors have allowed things to come together that provide the impetus for so much productivity in 2013.

“The first is Dr. Steadman’s overall leadership. He has always seen this Institute as an important means to validate and self-enforce a grade card as to how we are doing. The way he communicates and thinks with people serves as a stimulus for the physicians and scientists. It
really gives us some guidance and food for thought in our everyday approach to these research problems. That kind of thinking yields studies, publications, and presentations.”

“The second intangible,” says Dr. Rodkey, “is that the attending surgeons at SPRI are truly interested in and dedicated to research. They share Dr. Steadman’s philosophy and as a result, they really want to know how they are doing and what’s coming next. They are willing to support the research financially, philosophically, and intellectually.”

A third underlying factor contributing to productivity is not intangible, according to Dr. Rodkey. “It’s technology,” he says, emphatically. “Clearly, the technological advances we’ve made at Steadman Philippon represent a gigantic step toward efficiency, reliability, and accuracy.”

Coen Wijdicks, Ph.D., senior staff scientist and director of BioMedical Engineering, and Karen Briggs, M.B.A., M.P.H., director of the Center for Outcomes-Based Orthopaedic Research (COOR), provide a closer look at how SPRI’s advanced technology translates into high-impact productivity.

**FOCUS**

“We have clearly defined goals and outcomes,” explains Dr. Wijdicks. “Once you know where you are going, you can have the greatest impact. We know how to optimize our processes. Our focus is sports medicine and we concentrate on our strengths. That makes the Steadman Philippon Research Institute one of the best in the world at what it does.”

Dr. Wijdicks adds that now that SPRI’s expertise has been established, corporations, institutions, and the medical/scientific communities look to SPRI to develop and validate new products, techniques, and procedures.

**EFFICIENCY**

“One of the reasons we are more efficient than ever is because of our data software system,” says Ms. Briggs. “Our software incorporates a system that allows the data to check itself. Ninety percent of patient-based verifications (related to procedures that have been performed) are done by email. Instead of sending 900+ messages a month by regular mail and hoping for a response, patients now receive email questionnaires. They are very responsive and the new system has made our communication with patients much easier.”

Ms. Briggs also credits the staff’s experience as a factor in improving efficiency. “Knowing and working with this database for 21 years allows us to be thorough and faster,” she explains. “When doctors and fellows come to us with a question, we can do a better job of answering that question, responding more quickly, and helping them get their findings published sooner.”

Individuals and institutions can often see the results of their contributions in a matter of months, not years. The average time required for a research initiative at Steadman Philippon is six to eight months. When a project takes longer, those who make the effort possible are given periodic updates by the principal researchers.

**IMPACT**

Focus and efficiency are impressive, but the impact of SPRI research is even more important.

“We are not trying to break records or beat the number of the previous year’s publications or presentations,” says Dr. Wijdicks. “Our goal is to maintain the quality of production regardless of external factors that are out of our control.”

“Our production is having an impact on the scientific and medical communities,” he continues. “The *American Journal of Sports Medicine (AJSM)*, for example, is the number one orthopaedic journal (out of 65) in terms of impact factor. This metric, according to the editors, shows that authors around the world pay attention. If a person looked at any 2013 edition of the *AJSM*, the Steadman Philippon Research Institute name was probably in it.”

Dr. Philippon’s landmark article on labrum reconstruction of the hip was the lead article in the August 2013 issue of the *AJSM*. In the December issue of the same publication, four of the articles were written by SPRI’s staff members.

“Peer-reviewed publications that incorporate relevant research provide a significant, credible resource among peers,” says Dr. Wijdicks. “Because it is published in such a large forum, the result is high impact and captures a large audience.”

**ACCOUNTABILITY**

Whether a person contributes $100, $1,000, or $100,000, that money is carefully managed so that 77 percent goes directly to research programs, while only 23 percent is spent on overhead. The percentage of contributions dedicated solely to research is one of the highest, if not the highest, in the world.

Some of the money is spent on items, supplies, and equipment that might be scientific-but-less-than-glamorous.

“We would not be able to collect data as we do if we did not keep our software updated and moving forward as medicine advances,” says Ms. Briggs. “We have to know what is in the professional literature, and it costs money to have access to that literature. We’ve hired some of the best minds in the country to
manage high-level statistical programs. Then we have to buy programs that will help our doctors make their presentations and present our research at meetings around the world.”

“We know the benefit of every surgical screw that gets donated,” adds Dr. Wijdicks, “and we appreciate the gift and the giver that make it possible. We want donors to know that their donations go to something necessary and good.”

CARE

Contributions also result in life-changing, patient-centered care. People are able to go about their normal daily activities, postpone or avoid joint replacement, participate in sports at every level, prevent injuries, and remain physically active throughout their lives because of procedures developed or refined at SPRI. Here are three examples:

“The research for Dr. Philippon’s labral reconstruction procedure began in 2005 when he came to SPRI,” says Ms. Briggs. “We’ve been keeping track of patients for seven years and have now validated that the procedure will last for an extended period of time. His research has directly affected patient care by changing the method of treating hip conditions and injuries.”

Dr. Steadman developed an arthroscopic procedure for injured knees called “The Package.” Patients who underwent the procedure were understandably worried about if and when they might have to return for another procedure—or possibly even need knee replacement.

Dr. Steadman’s team conducted long-term monitoring of the repaired knees’ “survivorship.” They found that many patients were able to delay total knee replacement for up to 10 years, allowing them to make informed choices about their future health care.

For his landmark study, Dr. Steadman was honored with the Richard O’Connor Research Award given by the Arthroscopy Association of North America. The study was published in the February 2013 issue of Arthroscopy.

Robert F. LaPrade M.D., Ph.D., received the 2013 Orthopaedic Research and Education Foundation (OREF) Clinical Research Award for his paper on “Improving Outcomes for Posterolateral Knee Injuries.” The award is officially recognized as the “Orthopaedic Nobel Prize” in the medical and scientific communities. Dr. LaPrade presented his paper at the combined annual meetings of the Orthopaedic Research Society and the American Academy of Orthopaedic Surgeons.

ONGOING INITIATIVES

“Your contributions are already at work and supporting new research initiatives,” concludes Dr. Wijdicks. “Investigations involving the hips, shoulders, knees, feet, and ankles are growing exponentially. The metrics used to define successful outcomes are becoming more demanding and more precisely defined.”

“In the coming years, the Steadman Philippon Research Institute will continue to solidify its role as a leader in sports medicine research. That research will impact the lives of those who contribute to SPRI, as well as those of patients throughout the U.S. and abroad.”

Why was 2013 an especially productive year for SPRI? Because your support made it possible.
The Steadman Philippon Research Institute was awarded the 2014 Excellence in Research Award from The American Orthopaedic Society for Sports Medicine (AOSSM) during the annual AOSSM Meeting in Seattle this past July. This is the first time that this award has been won by the Institute since the award was established in 1988.

This recognition is given to the best paper submitted in any category to the AOSSM Awards Committee, a world leader in sports medicine education, research, communication, and fellowship. The award is a symbol of quality and research excellence. It is also a symbol of international collaboration.

The award-winning research was conducted in partnership with Lars Engebretsen, Ph.D., from the Oslo Sports Trauma Research Center in Norway and Robert LaPrade, M.D., Ph.D., of the Steadman Philippon Research Institute in Vail.

**TITLE OF SUBMISSION:**
Posterior Cruciate Ligament Graft Fixation Angles: Biomechanical Evaluation for Single- and Double-Bundle Reconstruction

**AUTHORS:**
Nicholas I. Kennedy, B.S., Mary T. Goldsmith, M.Sc., Scott C. Faucett, M.D., Matthew T. Rasmussen, B.S., M.Sc., Garrett A. Coatney, Lars Engebretsen, M.D., Ph.D., Coen A. Wijdicks, Ph.D.

This study was partially funded by the Norwegian Health South-East (Helse Sør-Øst) Regional Health Authority. Founded in 1972, AOSSM is an international organization of orthopaedic surgeons and other allied health professionals dedicated to sports medicine. This award is a symbol of quality and research excellence.
Dr. Jeff Nepple, a Sports Medicine Fellow (class of 2012–2013) at the Steadman Philippon Research Institute, was honored October 12–13, 2013 in Munich, Germany, with a major international award presented by ISHA at its annual scientific meeting. He was one of eight finalists.

The Richard N. Villar Trainee Excellence in Clinical Research Award was presented to Dr. Nepple for his presentation of research conducted during his fellowship year at SPRI titled “The Effect of an Acetabular Labral Tear, Repair, Resection, and Reconstruction on the Hip Fluid Seal.” The award was created to recognize young researchers who contribute high-quality research and information. Residents and fellows with a study related to hip arthroscopy were encouraged to apply.

SPRI Sports Medicine Fellowship Deputy Director and Chief Medical Officer Robert F. LaPrade, M.D., Ph.D., commented, “It is my pleasure to announce that an SPRI Sports Medicine Fellow was recognized with an international research award this past Saturday in Munich, Germany.”

“Since the opening of the new SPRI Laboratories in 2011, there have been two fellowship classes that have had the opportunity to perform quality research within BioMedical Engineering, and Jeff’s year represents the second fellowship class with a member to win an international award.”

Earlier this year, Dr. Jeff Padalecki won the Albert Trillat Young Investigator’s Award presented by the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine at its biennial congress. The award was based on his research on the effects of radial root tears and repairs on medial compartment joint loads and contact areas.

The ISHA Awards Program is committed to recognizing and honoring young researchers whose work has contributed to better understanding and communication within the field of hip arthroscopy.

ISHA was established in 2008 to further the development, through education and research, of arthroscopic hip surgery. Dr. Marc Philippon is a founding member.
The Steadman Philippon Research Institute and The Steadman Clinic announced their official designation as a National Medical Center within the United States Olympic Committee’s National Medical Network, one of only two such centers since the network was first announced in August 2013.

“The Institute has one of the largest orthopaedic patient databases in existence, and its research is published worldwide in peer-reviewed professional journals. The patient treatment protocols developed and used by the physicians at The Steadman Clinic are validated through this research. The quality of SPRI’s research and the outcomes of patients at The Clinic have led to several of the physicians becoming thought leaders in the field of sports medicine orthopaedics,” says Karen Briggs, SPRI director for Outcomes-Based Orthopaedic Research.

“Our goal is to contribute to Team USA by delivering the highest standard of evidence-based orthopaedic care and personal attention to Team USA athletes,” says Dr. Marc J. Philippon, co-chairman of the Steadman Philippon Research Institute and managing partner of The Steadman Clinic.

The Institute’s commitment to research and the Clinic’s philosophy of providing evidence-based care to elite athletes as well as people who just want to live an active lifestyle have produced countless success stories both on and off the awards podium.

“We are pleased to have the chance to give back to the athletes who have worked so hard to become Olympians and Paralympians, and we look forward to working with Team USA for many years to come,” says Dr. Richard Steadman, who founded the nonprofit entity now known as the Steadman Philippon Research Institute.

Through its fellowship program, the Institute has graduated 196 orthopaedic surgeons now practicing in multiple locations in the United States and abroad.

“The Steadman Philippon Research Institute and The Steadman Clinic are highly honored to be designated a USOC National Medical Center, serving the athletes of the western United States,” says Dr. Philippon.

“We are pleased to have the Steadman Philippon Research Institute and The Steadman Clinic join the USOC’s National Medical Network as a national partner,” says Alan Ashley, USOC chief of sport performance. “The variety and value of services that this collaborative project will provide is a great resource for Team USA, and we are excited to see the expansion of the National Medical Network, which now includes two national and five regional medical centers.”
Athletes with nicknames like “The War Horse” and “Kikkanimal” are expected to be different, perhaps special. You get both with Andrew Weibrecht and Kikkan Randall.

Andrew “The War Horse” Weibrecht has overcome devastating injuries and near-impossible odds to win medals in the 2010 and 2014 Olympic Super G competition—the Super Giant Slalom. He got his nickname because of the way he attacks the course. Nobody comes out of the gate like The War Horse.

A coach used to shout at him before the start of a race, “Let the wombat out of the cage!” One of his competitors said, “If there is one guy who risks everything, it’s Andrew.”

Cross-country skier Kikkan Randall is a four-time Olympian. She has won three consecutive World Cup Sprint titles and is the most decorated cross-country skier in American history. In her career, she has won 17 U.S. Championships and 21 World Cup podiums, and her 2013 and 2014 sprint titles placed her third overall in the World Cup standings—both records for the U.S. women.

How do you explain a first name like Kikkan and a nickname like “Kikkanimal”? You can’t. Only Kikkan (pronounced Keek’ an) can. “My parents came up with a combination of Kikki (inspired by Christine “Kiki” Cutter, the first American to win a World Cup title) and Megan, which was a popular name about the time I was born. We later learned that ‘kikkan’ is the Swedish expression for little girl, which gets me a few extra cheers when I race in Scandinavia.”

“Teammates over the years have used variations of Kikkan, not all of which I can mention here, but in high school they started calling me ‘Kikkanimal’ because I was always pushing to do more, work harder. They said I was like an animal they had never seen before, and ‘Kikkanimal’ stuck. I like the attitude that the nickname embodies.”

**MULTIPLE SPORTS**

Weibrecht and Randall have more in common than unusual nicknames. Both played multiple sports as kids and both had early success in their skiing careers.

“I played soccer, lacrosse, and a lot of tennis,” says Weibrecht, “but skiing was my best sport. By the time I was 12 or 13, I was beginning to stand out. At 15, I won the children’s world championship called the Trofeo Topolino Games in Italy, and I was third at the Junior World Championships in 2006. That sort of showed me that I could compete at the international level.”

Kikkan Alpine-raced seriously for a few years and thought it might be her sport, but she also ran track and played soccer. It wasn’t until she was 16 that she went into cross-country skiing fulltime. She got a top ten in her first junior championship event and by the age of 19 was a member of the U.S. Ski Team.

**FAMILY HISTORY, EDUCATION EMPHASIS**

Both Randall and Weibrecht come from families with a sports and education background. Kikkan has an aunt and uncle who were Olympic cross-country skiers. Andrew’s dad was a football player.
and his mom was on the U.S. luge team. His two brothers were ski racers and competed in college.

Kikkan and Andrew are both students—Andrew at Dartmouth, Kikkan at Alaska Pacific University. Andrew’s wife, Denja, has two degrees and teaches in the Lake Placid area. Kikkan’s husband, Jeff Ellis, is a former Canadian athlete in two sports and now the marketing and media coordinator for the FIS Cross-Country World Cup.

“When I win a race, he gets to interview me,” says Kikkan.

MEMORABLE OLYMPIC EXPERIENCES

“Every Olympic experience has been unique and memorable for me,” says Kikkan. “The first one was in Salt Lake, where I was born. I felt very much at home. Four years later, Turino was exciting because I had my first top ten Olympic finish. By the time we went to Vancouver, I was consistently among the top finishers and it was cool to be back and racing in Canada. Sochi was my first real chance to get to the Games with medal potential.”

2010 was a breakout year for Andrew. “I had been getting better every year and was getting great results. Then I went to the Olympics and won a bronze medal. Everything was going perfectly. Four years later, after so many injuries, I decided to give it one more shot. Winning another medal (silver) made everything worth it.”

INJURIES

Athletes suffer injuries, and skiers seem to get more than their fair share. Kikkan had a “massive” blood clot in her leg that threatened her career, but it happened at the end of the 2008 season and she had time to recover from the ordeal.

“My foot injury was worse,” she says. “Pain in my right foot started developing during the 2012 season. I managed to train through it and then tried to ignore it, but by August my coach told me we were going to have to do something about it before it got even more serious. He recommended that I see Dr. Thomas Clanton at The Steadman Clinic and the Steadman Philippon Research Institute.”

During the past four years, Andrew had more surgeries than top ten finishes. Right shoulder, left shoulder, right ankle, and left ankle—all since the Olympics in Vancouver in 2010.

“There were lots of internal struggles. I didn’t tell anyone, but if it had not gone well in 2014, I was going to be done with it. I loved the sport, but I don’t think I could have gone through that cycle of injuries again.”

THE CLANTON CONNECTION

Dr. Clanton has now treated both Kikkan and Andrew successfully. He is an internationally recognized orthopaedic surgeon who joined The Steadman Clinic and SPRI in August 2009 as the director for foot and ankle sports medicine. He specializes in injuries to the lower extremities and the foot and ankle, and has treated many professional and collegiate athletes, including former NBA player Yao Ming, NFL star and Heisman Trophy winner Eddie George, and World Champion hurdler Liu Xiang.

KIKKAN’S STRESS FRACTURE

“Dr. Clanton diagnosed my injury as a stress fracture and gave me the advice I really needed to hear,” says Kikkan. “First, I didn’t need surgery. I backed off my training schedule, took time to recover, and he set me up with orthotics after discovering that my skis were not supporting my feet in the right way.”

“One of the great things about The Steadman Clinic is that I could go right downstairs to Howard Head Sports Medicine to get started on my rehab program. Working with Ana Robinson Jeronimus, my physical therapist, I was able to improve my balance, strength, and stability, and to take pressure off my foot. I still do the exercises Ana showed me.” (Ana also worked with Andrew when he was in Vail.)

ANDREW’S BROKEN ANKLE

Andrew had two surgical procedures for his broken ankle with Dr. Clanton. His Olympic silver medal and performance during the 2013-2014 season reflect the success of those operations. He says he feels better now than at any time since 2010.

“There are very few orthopaedic hospitals in the world that can match the reputation of The Steadman Clinic,” says Andrew. “It made sense for me to go somewhere that can provide the best care. I prefer to have a physician like Dr. Clanton, who does 300 foot and ankle operations a year.”

Kikkan adds that Steadman is really unique in that the physicians understand the athlete’s perspective. “It’s important to have a doctor who can appreciate the different components of elite training and racing, and design a treatment plan that gets you back to your sport as soon as possible.”

ON THE AGENDA

Andrew and Kikkan are training for the 2014-2015 season and hope to be teammates again in the 2018 Winter Games in South Korea. Watch “The War Horse” to see how he attacks courses and goes after his third medal. And follow “Kikkanimal” on her quest to become one of the rare athletes who will have participated in five Olympic Games.
Among the things Olympic skiers Andrew Weibrecht and Kikkan Randall have in common is that they both worked through serious injuries, both were treated successfully at The Steadman Clinic by Dr. Thomas Clanton, and both benefitted from ongoing research conducted by Dr. Clanton and his colleagues at the Steadman Philippon Research Institute.

“Regardless of the injury or the level of the athlete, it is never easy to deal with an injury,” says Dr. Clanton. “It represents a setback and a roadblock to one’s goals. That is why it is essential to have a physician, along with others on the healthcare team, who understand sports and can guide the athlete to successfully surmount such roadblocks.”

“In Kikkan’s case, this was primarily through recognizing the incredibly stressful training schedule through which she had put herself, analyzing the causes of her stress-related injury, and prescribing a course of calculated rest and resumption of training that still enabled her to heal and reach her goals,” explains Dr. Clanton.

“In Andrew’s situation, the problem was a structural issue that had reached the point of interfering with his ability to compete at the highest level. Surgery was necessary to correct the problem. Not only was it important to be able to explain to Andrew what the surgery would do, but he also needed to know the proper course of rehabilitation and the timeline for a return to high level competition.”

Dr. Clanton adds that for these two great athletes, as well as others who face similar injuries, it is an indomitable attitude and a spirit of perseverance that leads to success.

THE MOST COMMON INJURIES

Foot and ankle injuries are among the most common seen in sports, according to Dr. Clanton. Ankle injuries alone are the most common in terms of time lost from training and competition. Other common injuries include tendon tears such as those of the Achilles, sprains such as those to the midfoot or big toe (turf toe), and various fractures such as traumatic breaks in the ankle or foot bones, as well as fatigue fractures.

“Prevention is better than having to miss time treating one of these injuries,” advises Dr. Clanton. “This can include proper training programs, developing strength and flexibility,

THE MOST COMMON MISTAKES

The most common mistake Dr. Clanton sees is failure to fully engage and complete the rehab process. He says it is important to recognize that injuries or surgery take a certain amount of time in order for the healing process to be complete.

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ONGOING FOOT AND ANKLE RESEARCH AT SPRI

Dr. Clanton and his colleagues recently completed a series of research projects and resulting publications on lateral ankle sprains and instability, looking at normal ligaments and their strength and stiffness compared with various methods of repair, reconstruction, and reinforcement surgically.

“Prevention is better than having to miss time treating one of these injuries,” advises Dr. Clanton. “This can include proper training programs, developing strength and flexibility,

avoiding high-risk situations, using bracing and taping (plus orthoses), and complete rehabilitation of minor injuries to prevent more serious ones.”

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Dr. John Feagin, a West Point graduate and former West Point team physician, was inducted into the Army Hall of Fame October 10, 2014. Dr. Feagin has been a close advisor and mentor to the Institute for more than 25 years.

“This Hall of Fame is a testament to the great tradition of athletics, Army and West Point,” said Army Director of Intercollegiate Athletics Boo Corrigan. “National champions, All-Americans and incredible athletes are being honored.”

Dr. Feagin graduated in 1955 and earned two varsity letters as a member of the swimming and diving team. He was commissioned into the Artillery Branch of the U.S. Army and graduated from Duke University School of Medicine in 1961. Feagin served as an orthopaedic surgical resident at Walter Reed Army Medical Center for four years and then as chief of orthopaedic services at the 85th Evac Hospital in Vietnam.

He returned to West Point as team physician in 1967 and worked closely with assistant football coach Bill Parcells and head basketball coach Bob Knight. Feagin is a founding member of the American Orthopaedic Society of Sports Medicine, the International Society of Knee Surgery and Arthroscopy, the Society of Military Orthopaedic Surgeons, and the American Orthopaedic Society for Sports Medicine.

An extensive author and lecturer, Feagin wrote “The Crucial Ligaments,” which helped revise the treatment of anterior cruciate ligament injuries. His book and papers are still used today in treating this common sports knee injury as well as in educating young orthopaedic surgeons.

Dr. Feagin served as the team physician for the U.S. Ski Team during the 1992 Winter Olympics after moving to Durham, N.C., to become an associate professor at the Duke University School of Medicine and chief of orthopaedic services in the Durham Veterans Administration Medical Center. He worked as team physician of the Duke basketball team under West Point graduate Mike Krzyzewski and helped found the Coach Krzyzewski -Nike Human Performance Laboratory.

Dr. Feagin was presented the Mueller International Knee Prize for a Lifetime of Contributions to the Sciences and Practices of Knee Surgery and was inducted into the American Orthopaedic Society of Sports Medicine Hall of Fame. He is an honorary member of the Army Football Letterman’s Club and as a U.S. Military Academy graduate, he established the John A. Feagin West Point Sports Medicine Fellowship.

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The scientific advisory committee consists of distinguished research scientists who represent the institute and serve as advisors in our research and educational efforts, in our fellowship program, and to our professional staff.

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John A. Feagin, M.D.
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Boston, Mass.

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Chief Medical Officer
Steadman Philippon Research Institute
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STEVEN ARNOCZKY, D.V.M., INDUCTED INTO THE AMERICAN ORTHOPAEDIC SOCIETY FOR SPORTS MEDICINE’S HALL OF FAME

Scientific Advisory Committee Member Steven Arnoczky, D.V.M., was inducted into the American Orthopaedic Society for Sports Medicine’s (AOSSM) Hall of Fame at its annual meeting in Seattle July 11, 2014.

Dr. Arnoczky is a sports medicine researcher from the Michigan State University College of Veterinary Medicine. He has conducted basic science orthopaedic research for 40 years and has served on the SPRI Board for 24 years.

STEVEN ARNOCZKY, D.V.M., Inducted Into the American Orthopaedic Society for Sports Medicine’s Hall of Fame

Only the second non-physician to receive this honor, Arnoczky is being recognized for basic science contributions to the advancement of ligament reconstruction of the knee and meniscal repair and replacement.

The AOSSM established the Hall of Fame in 2001 to honor members of the orthopaedic sports medicine community who have made original and significant contributions to the specialty. Induction is the highest honor given to a society member. There are currently 58 members from 11 countries in the Hall of Fame.

KENNEDY LECTURESHP HONORS SPRI ADVISOR LARS ENGBRETSEN, M.D., PH.D.

One of the highlights of each year’s Sports Medicine Specialty Day, held on March 15 in 2014, is the John C. Kennedy Memorial Lectureship. Dr. Lars Engebretsen, a member of the Institute’s Scientific Advisory Committee, was honored as the Distinguished Lecturer for 2014.

An internationally recognized authority in orthopaedic sports medicine, Dr. Engebretsen serves in many capacities, including professor and chair, University of Oslo; professor in Sports Medicine, Norwegian School of Sports Science; professor in Sports Medicine, Oslo Sports Trauma Research Center; and head of Medical Sciences, International Olympic Committee.

In 2001, Dr. John Feagin, also a member of the Scientific Advisory Committee and professor emeritus of orthopaedic surgery at Duke University, was honored as the Distinguished Lecturer.

This lectureship is named in honor of John C. Kennedy, M.D., F.R.C.S., a past president of the American Orthopaedic Society for Sports Medicine.
In 2013, SPRI received 1,196 separate gifts and support from individuals, foundations, and corporations. This combined support, including special events, amounted to $4,385,518.

The Institute is grateful to the following individuals, corporations, and foundations for their support of the Institute in 2013. Their vision ensures the advancement of evidence-based medical research and joint preservation research, science, and care, as well as the education of physicians for the future. We extend our gratitude to these supporters for their generous contributions.
On November 9, 1988, the Institute was incorporated as a not-for-profit educational and research organization dedicated to advancing modern medical science and the education of young physicians. The Institute is deeply grateful to the following members of the distinguished 1988 Society, whose cumulative giving totals more than $1 million.

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THE FOUNDER’S LEGACY SOCIETY

Over the years, the Institute has been privileged to receive generous and thoughtful gifts from friends and supporters who remembered the Institute in their estate plans. In fact, many of our friends—strong believers and supporters of our work today—want to continue their support after their lifetimes. Through the creation of bequests, charitable trusts, and other creative gifts that benefit both our donors and the Institute, our supporters have become visible partners with us in our mission to keep people physically active through orthopaedic research and education in arthritis, healing, rehabilitation, and injury prevention.

To honor and thank these friends, the Founders’ Legacy Society was created, recognizing those individuals who have invested not only in our tomorrow, but also in the health and vitality of tomorrow’s generations.

Our future in accomplishing great strides, from understanding degenerative joint disease, joint biomechanics, and osteoarthritis to providing education and training programs, is ensured by the vision and forethought of friends and supporters who include us in their estate plans. The Institute’s planned giving program was established to help donors explore a variety of ways to remember the Institute.

We are most grateful to these individuals for their support in becoming founding members of the Founders’ Legacy Society:

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Mr. Robert E. Repp
Mr. Warren Sheridan
Dr. Dawn Ommen, a Nebraska native and current SPRI research assistant, has brought a perspective to her work with Dr. Marc Philippon that may be unmatched. Who else can say she has been an NCAA Division I athlete, a college coach, a certified physical therapist, a hip surgery patient, a physician, and a medical researcher?

Dr. Ommen will tell you that none of her achievements have been easy. In fact, that’s exactly what she recently told a group of young student-athletes in Colorado. Her never-ever-give-up attitude has put her in a position to make major contributions as a sports medicine physician and to inspire others to strive for ambitious goals.

**FIRST BIG GOAL**

“My first big goal coming out of high school was to play Division I college basketball,” she recalls. “I didn’t have a lot of scholarship offers, perhaps because I was short and slow. But I walked on at Kansas State and played for two years before transferring to the University of Nebraska to graduate.”

Her experience as a college athlete opened the door to be a college coach. She coached for one year at the University of Nebraska-Kearney and two years at the University of North Florida.

Her interest in sports and medicine led to graduate school and earning a Master of Physical Therapy degree at St. Ambrose University in Davenport, Iowa. “At the time, I thought about med school, but physical therapy seemed to be a natural way to go.”

Dr. Ommen worked as a certified physical therapist for five years, part of that time as a wellness director of a program that won a national wellness award. She also helped the company decrease the bottom line on health insurance.

**FIRST BIG OBSTACLE**

Being a physical therapist added to her growing body of expertise and experience, but it led to what she describes as her first big obstacle. She suffered a hip injury while teaching a physical therapy student. The injury was misdiagnosed and mistreated for almost five years and included a procedure in which four screws were placed in her lower back. They didn’t work.

That’s when she heard about Dr. Philippon, who was then at the University of Pittsburgh—not exactly down the street from her home in Nebraska. “As the pain became more and more debilitating, I talked to a friend who had similar symptoms and who had been successfully treated by Dr. Philippon, and I was able to get an appointment with him.”

Dr. Philippon eventually performed surgery on both of Dr. Ommen’s hips, including the world’s first ever ligamentum teres reconstruction via an iliotibial band. Since then, she has been able to return to a high level of competition and is an avid triathlete, snow skier, water skier, and weight lifter.

**FIRST BIG FAILURE**

Dr. Ommen continued to be a patient of Dr. Philippon after he moved to The Steadman Clinic and the Steadman Philippon Research Institute. She was inspired by the cutting-edge medicine she received.

“As a patient, it amazed me that every time I had an appointment or a procedure, there was always something new—whether it was...
a surgical technique, an anticoagulation regimen, or a change in rehabilitation exercises,” she says. “It’s obvious that Dr. Philippon is continually seeking to improve his world-leading surgical outcomes.”

Her experience with The Clinic and her awareness of the Research Institute motivated her to go to medical school, with the goal of becoming a sports medicine physician. “Not so fast,” she tells her audience. “I had to take the MCAT to get into school and I didn’t score well enough.”

“Should I try again?” she asked herself and her husband, Kevin, a high school math teacher and robotics coach in Nebraska.

“Yes,” they both answered.

So she did take the MCAT again, scored well, was accepted, and graduated from the University of Nebraska College of Medicine in May of 2013.

**BECOMING PART OF THE SPRI TEAM**

During one visit to see Dr. Philippon, Dr. Ommen asked about the possibility of a research assistantship at SPRI. He liked the idea and arrangements were made for Dr. Ommen to spend a year working with Dr. Philippon on a variety of research projects, including what she thinks could become a landmark study on the effects of prehabilitation on hip arthroscopy.

“There is a phenomenal relationship between The Clinic and the Research Institute,” says Dr. Ommen. “There is no wasted data here. Dr. Philippon and his colleagues are using that data to change what is going on in hip arthroscopy.”

Dr. Ommen’s medical records are part of SPRI’s famous database. As a research assistant and former patient, she may be analyzing information taken from her own hip surgery procedures. Yet another perspective.

“I feel like I live and work at Disneyland out here in Vail,” says Dr. Ommen.

**THE DRIVING FORCE**

A person cannot achieve what Dr. Dawn Ommen is achieving without tremendous support. That support, she says, has come from Kevin, her husband of 11 years.

“He has been the driving force. He’s been with me through injuries, numerous surgeries, travel to get treatment, and getting me through school. He was the one who said you have to go back to medical school.”

**ON THE AGENDA**

Dr. Ommen’s medical training is not complete. She will soon learn where she will spend the next three years as a resident, and then there will be an additional year as a sports medicine fellow. Her long-term goal is to establish a sports medicine center that will address the surgical, rehabilitational, nutritional, and psychological needs of women athletes.

It sounds like a monumental task, but don’t tell Dr. Ommen she can’t do it. She has a well-documented record in the field of perseverance.

And now she can look at things from yet another perspective: that of a parent. Kevin and Dawn Ommen delivered their first child in April.

The education of orthopaedic surgeons is a critically important mission of the Institute. Academic Chairs provide the continuity of funding necessary to train physicians for the future, thus ensuring the continued advancement of medical research.

Currently, more than 190 SPRI fellows practice around the world. We wish to express our gratitude and appreciation to the following individuals and foundations that have made a five-year, $125,000 commitment to the fellowship program to support medical research and education. In 2013, four chairs provided important funding for the Institute’s research and educational mission. We are most grateful for the support from the following individuals:

Mr. and Mrs. Lawrence Flinn  
Mr. and Mrs. Peter Kellogg  
Mr. and Mrs. Al Perkins  
Mr. and Mrs. Steven Read
VISIONARIES

Medical research and education programs are supported by gifts to the Institute’s annual fund. Visionaries are those patients and their families, trustees, staff, corporations, and foundations whose lifetime cumulative giving totals $10,000 or more.

Donors at this level support many programs, including the Institute’s research to validate the success of new treatments for degenerative arthritis and identify factors that influence treatment success. For example, as youth sports injuries rise to epidemic proportions due to early specialization and extensive practicing, the Institute is researching conditions and injuries commonly associated with specific sports, such as hip impingement in young hockey players, to determine how to prevent and treat them. Injuries in growing children may cause unforeseen complications during adulthood, such as an early onset of osteoarthritis.

Visionaries’ gifts ensure the advancement of evidence-based medical research, joint preservation research, science, and care, as well as the education of physicians for the future. We extend our gratitude to these individuals for their lifetime of support:

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In 2013, individuals, corporations and foundations contributed $5,350,165 to support the Institute's research and education programs.

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($ MILLIONS)

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Mr. and Mrs. Mitch Hart
The Fred and Elli Iselin Foundation
Ms. Mary Noyes
Mr. and Mrs. Jay Precourt
Mr. and Mrs. Stewart Turley
THE YEAR IN RESEARCH AND EDUCATION
A team of physicians and scientists in the Department of BioMedical Engineering at SPRI led by Dr. Marc Philippon, Dr. Robert LaPrade, and Coen Wijdicks, Ph.D., is conducting preliminary studies to determine if injections of platelet-rich plasma (PRP) can hasten the healing process in injured knee ligaments.

PRP is derived by taking blood from a patient, subjecting it to a process that separates the blood into various components, then harvesting the PRP component and re-injecting it into the same patient. The concentration of platelets is thought to supply important growth factors that promote healing. The process is relatively easy to perform and surprisingly inexpensive.

**INCREASED ATTENTION**

PRP is drawing increased attention, but most of it comes as a result of anecdotal reports involving high-profile elite athletes. Among the injuries that have been treated using PRP are those involving the collateral ligament (MCL) and anterior cruciate ligament (ACL), as well as conditions such as patellar tendinitis and elbow tendinosis. The results have been mixed.

Despite the lack of scientific studies proving a beneficial effect, the number of injections of PRP worldwide in elite and recreational athletes adds up to thousands of injections performed in the United States and Europe. This could translate into millions of dollars spent per year on an unproven treatment.

According to SPRI’s Dr. Robert LaPrade, “Science has progressed greatly in the past decade, offering significant promise in the area of PRP, stem cells, and growth factors. However, future studies and additional research are needed so that we can take what we are learning at the scientific level and turn these into realistic, credible treatment recommendations for patients who are under the care of their orthopaedic physician.”

With all of the publicity, it is not unusual for patients to demand PRP treatment from their orthopaedists. If they don’t get the treatment, many of them will seek other clinicians who will administer PRP, whether its indications are evidence-based or not. These demands put tremendous pressure on physicians to use a treatment for which very few good basic research studies and randomized clinical trials exist.

No randomized clinical trials have been performed to confirm that PRP specifically accelerates MCL healing.

Based on the mixed results for ACL and other ligaments, it is difficult to project whether PRP would have a beneficial effect on injured MCLs.

**MOST COMMONLY INJURED LIGAMENT**

The MCL is the most commonly injured ligament of those supporting the knee, and the incidence of the injury is twice as high in males as in females. MCL tears or ruptures may not heal without intervention. One of those interventions is surgery, which has been shown to accelerate healing and hasten the return to performance. However, surgery is expensive, does not always allow the athlete to return to full performance, and may be associated with painful complications.

The surgeons and scientists at SPRI, working with the Colorado State University Orthopaedic Research Center, are proposing tests using biological models to determine if the effects of PRP can accelerate MCL healing. The BioMedical Engineering team has extensive experience in studying growth factor effects on musculoskeletal healing.

The specific aims of the study will be 1) to determine if a single dose of PRP at different platelet concentrations can accelerate healing when compared with a saline placebo, and 2) to determine if the highest PRP concentration can accelerate healing when injected at multiple time intervals.

The study, funded by The Kenneth and Anne Griffin Foundation, has been submitted to the American Orthopaedic Society of Sports Medicine and has received excellent reviews. A pilot study has been completed and the SPRI/Colorado State research teams expect to have preliminary results in 2014.
The purpose of the Center for Translational and Regenerative Medicine Research (CTRMR), formerly Basic Science Research, is to gain a better comprehension of factors that lead to 1) degenerative joint disease, 2) osteoarthritis, 3) improved healing of soft tissues such as ligaments, tendons, articular cartilage, and meniscus cartilage, and 4) new and untried approaches of treatment modalities.

Our emphasis is on understanding the effects of injuries and then enhancing therapies at the joint, tissue, and even cellular levels. We perform in vitro (laboratory) and translational (animal) studies before human use. Our ultimate goal is to regenerate, not just repair, injured tissues. That is, we focus our efforts on regenerative medicine.

The relatively new area of regenerative medicine coupled with biological enhancement of tissue healing is an exciting one that has gained global attention, especially in the areas of orthopaedic sports medicine and in the care of combat casualties from our military services. Many of the applications lend themselves to treatment of posttraumatic osteoarthritis. There are many new and innovative techniques under investigation by scientists around the world, including stem cells, blood products, and synthetic materials that exploit new sciences such as nanotechnology and electrospinning. One of the broad goals of this work can be stated simply as joint preservation.

ACCOMPLISHMENTS

- Three publications in quality peer-reviewed books.
- Twenty-five presentations in eight different countries.
- Served on two major international research committees.
- Served on the editorial board of directors of a major knee journal.
- Served as a peer reviewer for four major orthopaedic sports medicine journals.
- Completed important studies and/or published articles on adult autologous stem cells, meniscus regeneration, and the microfracture technique and rehabilitation.

PUBLICATIONS

In 2013, the department had three publications in high-quality and leading textbooks, including:

- The ACL-Deficient Knee. A Problem Solving Approach
- Surgical Techniques of the Shoulder, Elbow, and Knee in Sports Medicine

GRANTS

No outside grants or patents were obtained in 2013. Philanthropic donations were solicited for and used specifically for some of the CTRMR research studies.

COLLABORATIVE EFFORTS

CTRMR continued its very strong and extremely well-established collaboration with Colorado State University (CSU). Specifically, we worked closely on many projects with the CSU Orthopaedic Research Center (ORC) under the direction of Dr. Wayne McIlwraith and his deputy, Dr. David Frisbie.

Our collaborations have been ongoing for nearly 20 years, and our joint efforts have led to many publications and presentations on the subject of cartilage repair and resurfacing. Several of these studies have influenced the way that microfracture is performed, and other studies have validated the postoperative
rehabilitation protocols that have been developed by Dr. Steadman. This collaboration with the CSU ORC is truly invaluable to CTRMR and to SPRI as an institute.

One such collaborative study in particular is worthy of note. An in vitro (“test tube”) laboratory study was conducted to assess the effect of the timing of administration of stem cells to pieces of articular cartilage that were subjected to a mechanical injury. This mechanical injury model has been validated previously by Dr. Frisbie and co-workers at the CSU ORC. In this present study, we also added interleukin-1 (a naturally occurring inflammatory protein that is increased in living joints following traumatic injury and promotes the degenerative osteoarthritic process) to emulate the inflammation that accompanies direct injury in traumatic joint disease. If this laboratory model is proven successful, its use would save a great deal of money and laboratory animal resources over traditional live animal studies. A successful model would also permit more studies to be done much more quickly, and the number of test products and testing protocols could be significantly increased. While this study is ongoing, the early findings suggest that this traumatic impact model with the addition of interleukin-1 provides a model that may closely mimic the joint environment in human patients following, for example, a ski injury. This finding will help guide our future studies. The second important interim finding is that the timing of when stem cells are administered seems to have no effect on results. We will continue to use this model and to analyze the specimens from the initial study.

We, of course, also collaborate with The Steadman Clinic attending staff and fellows. This collaboration is always fruitful and helps us assure that our work is clinically focused.

**PROJECTIONS**

The future looks very bright for regenerative medicine, and we believe that the Center for Translational and Regenerative Medicine Research can truly make a difference in this area of biomedical and orthopaedic sports medicine research. Some of the areas we will continue to pursue include:

- Functional tissue engineering
- Synthetic matrices
- Gene therapy
- Cellular therapy
- Stem cells, circulating progenitor cells, others
- Platelet-rich plasma (PRP)
- Mechanisms of action, dose optimization, etc.

All of these future projects focus on improved tissue healing and regeneration. In other words, we believe that the discipline of regenerative medicine is not only the future, but it is also right now.
DEVELOPING PROGRAMS TO PREVENT HIP INJURIES IN YOUNG ATHLETES

By Dawn Ommen, M.D.

Editor’s note: Dr. Ommen is currently completing a research internship in the Center for Outcomes-Based Orthopaedic Research department of the Steadman Philippon Research Institute.

Dr. Philippon and his staff just completed the fourth consecutive year of physical hip screening for pre-adolescent/adolescent athletes. The purpose of the screening is to look for any indication of femoroacetabular impingement (FAI), an abnormal bone growth in the hip joint that can lead to hip pain and labral tears.

FAI is a common diagnosis in Dr. Philippon’s patient population and is seen at a higher rate in the athletic community as compared with the general public. Indications of FAI are being found in young athletes, sometimes even before the onset of symptoms. The goal of the screening is to identify factors related to developing FAI and, ultimately, to develop an exercise prevention program that would allow these athletes to continue with their sports and be active throughout their lifetimes.

The number of athletes participating in the study has increased every year. This year we were able to more than double our prior participant numbers, as 77 athletes completed the study. This included 28 hockey players, 42 skiers, and seven figure skaters between the ages of nine and 17.

Figure skaters were a new addition to the study this year. The study consists of two parts: an abbreviated hip MRI and a clinical hip exam.

The clinical exam is similar to the exam that professional and Olympic athletes experience as one of Dr. Philippon’s patients. The exam consists of range of motion, strength testing, and specific hip motion tests. These clinical results are correlated with a musculoskeletal radiologist’s reading of the patient’s MRI.

Erin, a mother of one of the study participants, knew right away that she wanted her child to participate in the study. “Being involved in healthcare myself and also being a lifelong athlete, I realize the importance of these types of studies. In addition, my child may benefit from the knowledge gained through this study in the future.”

Erin indicated that the experience that her child had during the study was a great learning opportunity into the world of medicine, experienced in a non-threatening atmosphere.

The data from the last three years of screening have resulted in two manuscripts that have been published in the American Journal of Sports Medicine, the premiere sports medicine journal in the world. One of the manuscripts reported that even at young ages, ice hockey players have a greater bone growth associated with FAI than skiers of similar ages.

The other publication identified and analyzed at-risk positions for the hip during specific hockey movements. With a significant increase in female athlete participation in this year’s screening, we are looking to analyze the differences seen in male and female athletes for the first time this year. In addition, in the fourth year of the study, we are gaining valuable longitudinal data as many of the study’s participants have completed the study each of the past four years.

This study was accepted to be presented as a poster at the International Olympic Committee Injury Prevention meeting in April. SPRI and Dr. Philippon would like to expand this screening in cooperation with the United States Olympic Committee medical team and United States Ski and Snowboard Association Sports Medicine.

This unique study is providing groundbreaking information in the young athlete population. Through this study, Dr. Philippon and his team are leading the way in identifying causes of an often debilitating hip condition in the competitive athlete, providing these and future competitors a better chance at an injury-free career and continued active lifestyle.

This study was partially funded by Mr. and Mrs. Paul Schmidt.
Patient-centered outcomes following surgery are those outcomes that are important to patients. More than 20 years ago, Dr. Steadman started developing a sophisticated system to document how patients felt about their surgery in order to improve the quality of orthopaedic care.

In 2013, the Center for Outcomes-Based Orthopaedic Research continued to document outcomes on every knee, hip, shoulder, and ankle patient who visited The Steadman Clinic. In addition, annual follow-up forms are emailed to more than 15,000 patients.

As healthcare evolves, COOR will continue to provide physicians and patients the information on outcomes of orthopaedic surgery to assist with decision-making. Outcomes provide the tool to help address concerns over how the healthcare dollar is spent and the results of that expenditure. This type of information will be important to policy-makers, payers, and patients as they increasingly seek information about treatments and innovations.

These outcomes are available for many procedures, including microfracture, which was developed by Dr. Steadman in the 1980s, and labral reconstruction in the hip, which was developed by Dr. Philippon over the past 10 years and validated by data from our registry.

As data continues to be collected and new procedures are developed, the value of the COOR data registry continues to grow. SPRI and COOR look forward to continuing to help patients and physicians with improved healthcare.

**KNEE STUDIES**

**Anterior Cruciate Ligament Reconstruction in Patients 40 Years or Older: 20- to 25-Year Follow-up**

Anterior cruciate ligament (ACL) injuries are most commonly seen in young active patients. The goal of ACL reconstruction is to return patients to high-intensity activities that may include twisting and cutting maneuvers. In the past, older patients who suffered an ACL injury were encouraged to change their activity level and avoid an ACL reconstruction. However, with the baby boomers staying active later in life, more ACL injuries are being seen in older patients, and these patients have a desire to return to activities and some to high-intensity activities. The goal as we age is to keep active to maintain health and decrease risk of diseases associated with sedentary lifestyles.

Bucking the trend of avoiding ACL reconstruction, in the late 1980s Dr. Steadman was performing ACL reconstruction on patients more than 40 years of age. With the number of knee replacements in adults ages 45 to 65 tripling over the last 10 years, we were interested in whether this group of patients had more knee replacements or continued with their active lifestyle.

From 1988 to 1993, 81 ACL reconstructions were performed in patients 40 years or older. The average age was 45, with a range from 40 to 60. Twenty years later, the average age was 68, with a range from 62 to 82. One patient had a reinjury 10 years following their reconstruction, and 24 percent of patients required a knee replacement at an average of 19 years following their ACL.
reconstruction. Patients who did not have a total knee replacement had good-to-excellent outcomes scores and are still active. (See comments from patients in boxes.) The median patient satisfaction with outcome at minimum 20 years follow-up was 10 on a scale of 1 to 10, with 10 being very satisfied. This study showed that patients 40 years or older can have an ACL reconstruction without increased risk of knee replacement, and if they don’t have knee replacement they have good function, are active, and are satisfied with the results.

Meniscus Suture Repair: 10-Year Outcomes in Patients over 40 Compared with Patients 40 and under

Meniscus tears are one of the most commonly seen orthopaedic injuries. Most tears are treated with debridement. However, with new research information showing the importance of preserving meniscus tissue, the number of repairs has increased. Removal of tissue surrounding the torn meniscus can often result in reduced protection of the surrounding articular cartilage surfaces. Previous studies have also shown that when large amounts of the menisci are excised, patients are more likely to develop knee osteoarthritis (OA) at a more rapid rate.

In the last 10 years, meniscus repair surgeries have drastically increased (Figure 1). Although multiple studies have documented outcomes following meniscus suture repair, only limited studies have compared outcomes following meniscus repair in patients less than 40 years old versus patients over 40 years old. Failure rates in patients over 40 have been documented to range from 9 percent to 27 percent. However, it is unclear if there is a significant difference in subsequent surgery rate and outcomes following meniscus suture repair. To better understand the long-term outcomes following meniscus suture repair, COOR gathered outcomes data at 10 to 21 years follow-up in patients under 40 and 40 years and over.

All patients 18 years or older who underwent meniscus suture repair by Dr. Steadman were included in this study. Patients were asked to complete a questionnaire at a minimum of 10 years following knee surgery and each year thereafter. Outcome measures collected include the Lysholm score to document function, WOMAC score to document pain and function, and the SF-12 score to document general health and patient satisfaction with outcome.

There were 191 knees in 187 patients (125 males, 69 females) with an average age of 33 who underwent meniscus suture repair and were included in this study. There were 142 patients 40 years or younger, with an average age of 27.5 years, and 49 patients over 40 years of age, with an average age of 50 years. Older age did not associate with a greater number of second surgeries.

The WOMAC Index is divided into three categories: pain, stiffness, and function. It is validated to measure outcomes following treatment for osteoarthritis.

The SF-12 survey measures perceptions about health. This information helps keep track of feelings of wellbeing and performance of daily activities.

The Lysholm score (0-100, 100=highest) and Tegner activity level (0-10, 10 = highest satisfaction) are common scoring systems utilized to evaluate outcomes of arthroscopic knee surgery. The Lysholm score measures symptoms and function. The Tegner activity level categorizes individuals based on the activities in which they participate.
Dr. Steadman, Can’t believe you still follow-up with me."

“I run, ski, play racquetball, volleyball, help with soccer, hunt, fish, backpack, all with abandon.”

“Two weeks ago I finished a 184-mile relay race around the mountains.”

“None of what I like to do would be possible without Dr. Steadman fixing my knee in 1987. That is 26 years of fun.”

Patients who were older than 40 had similar function and satisfaction with outcome compared with patients 40 years or younger. Patients who underwent meniscus suture repair had high function and high patient satisfaction at an average 16 years following meniscus suture repair. This study shows that patients 40 years and older can do just as well following surgery as patients who are younger than 40.

Microfracture: 30 Years Later

In the early 1980s, Dr. Steadman began developing the microfracture technique—a relatively quick and minimally invasive surgical technique to stimulate articular cartilage repair. The goal was to create a combination of surgery and rehabilitation that would allow for cartilage repair tissue to form. Most prior cartilage procedures had little to no emphasis on the postoperative period. The surgical goal was to create fractures in the subchondral bone perpendicular to the surface and to be able to reach all areas of the joint. The creation of these fractures would release blood and bone marrow, which would form a large clot and produce the cells that can create new cartilage. Creating these fractures required various angled picks. Previous work had been done with drills, but drills could not reach all areas of the joint and when used, they produced heat that could limit the development of new tissue. A secondary goal was to provide a situation in which the marrow clot would stay in place. When a microfracture was created, the rough surface attracted and held the clot.

Now 30 years later, microfracture is performed in the knee, hip, shoulder, elbow, ankle, and hand joints. When done properly with the correct postoperative protocol, microfracture has been shown to be very successful in returning patients to their desired activities. Today, microfracture has its own surgical procedure code (CPT), and over 300 publications on microfracture in the knee are referenced in PubMed.

In 2012, the paper “Outcomes of microfracture for traumatic chondral defects of the knee: Average 11-year follow-up,” by Dr. Steadman and others, was named one of the top 25 most cited articles in all of the arthroscopic orthopaedic literature. Today, microfracture is the most common cartilage repair technique being used in the U.S., and the incidence continues to grow. The following table is a summary of the number of cartilage procedures performed over several years from analysis of a large payer database.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microfracture</td>
<td>72,887</td>
<td>74,433</td>
<td>70,629</td>
<td>75,436</td>
<td>76,777</td>
<td>84,780</td>
<td>78,456</td>
</tr>
<tr>
<td>Arthroscopic autograft</td>
<td>1,181</td>
<td>1,376</td>
<td>1,137</td>
<td>1,074</td>
<td>999</td>
<td>1,155</td>
<td>1,044</td>
</tr>
<tr>
<td>Arthroscopic allograft</td>
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<td>1,202</td>
<td>971</td>
<td>832</td>
<td>719</td>
<td>631</td>
<td>662</td>
</tr>
<tr>
<td>ACI</td>
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<td>630</td>
<td>742</td>
<td>728</td>
<td>767</td>
<td>1,446</td>
<td>1,343</td>
</tr>
<tr>
<td>Open osteochondral allograft</td>
<td>660</td>
<td>808</td>
<td>848</td>
<td>663</td>
<td>863</td>
<td>1,351</td>
<td>1,619</td>
</tr>
<tr>
<td>Open osteochondral autograft</td>
<td>496</td>
<td>509</td>
<td>653</td>
<td>798</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
developed. Microfracture was developed and proven effective and continues to be the treatment of choice for cartilage defects.

**HIP STUDIES**

**From Development to Validation: Hip Labral Reconstruction**

In 2005, Dr. Philippon developed a new technique for hip labral reconstruction. This procedure was for patients who had labral damage that could not be repaired and if removed, would not leave enough labrum to do its job. The technique uses a graft from the patient’s own thigh. The graft is made into the shape of a tube and then placed around the acetabulum to replace the missing labrum. Early results of this technique were published in 2010; however, it was not clear yet if the graft would last.

COOR then gathered midterm follow-up on the patients. Eighty-seven percent of patients who did not have signs of osteoarthritis did not require another surgery three years following surgery. At an average of four years after surgery, patients had excellent improvement in their outcome scores and reported high satisfaction with outcome. This study showed that acetabular labral reconstruction is a good option to manage patients with labral deficiency who continue to be symptomatic, rather than having to resort to a joint replacement at a significantly young age.

Following this study, we published a study on labral reconstruction in the professional athlete. Only athletes who were on an Olympic team or played sports as their primary job were included in the study. There were professional soccer, hockey, football, baseball, and basketball players. In addition, two Olympic skiers were included. Two athletes required total hip replacement. However, they were older and at the end of their playing careers. Of the rest of the athletes, 86 percent returned to professional sports and 81 percent returned to their previous level of play or better. This was determined by comparing the players’ sport statistics two years prior to surgery with those two years following surgery. These statistics included games played, minutes played, goals or points scored, etc.

**WHAT IS FAI?**

Femoroacetabular impingement (FAI) occurs when abnormally shaped bones of the hip repetitively hit each other during movement. As a result, soft tissue structures of the hip, including the acetabular labrum and the articular cartilage, are often entrapped and injured. Impingement is particularly common in hip flexion and internal rotation, a position frequently encountered during activities of daily living. Difficulty with putting on shoes and socks and getting into and out of a car are common complaints in patients with extensive impingement.

There are two distinct types of FAI, cam and pincer. Most commonly, patients have a combination of the two types of impingement. Cam impingement results from excess bone located on the femoral neck. Pincer impingement results from excess bone located on the acetabulum. The precise cause of the impingement is unknown, but it likely has both developmental- and activity-related (such as in contact in sports) components.

In both types of impingement, the abnormal contact between the femoral head and acetabulum during movement causes injury to the labrum and articular cartilage. Injuries to the acetabular labrum lead to increased movement of the femoral head within the acetabulum, resulting in an unstable joint. Also, tears of the acetabular labrum result in increased contact forces between the femoral head and the acetabulum. With these increased forces, damage to the articular cartilage may result. Injuries to the articular cartilage over time may increase in size and depth, and ultimately result in bone-on-bone contact. At this point, the only current solution is a total hip replacement.
These two studies provided clinical validation for the use of the labral reconstruction in both elite athletes and the recreational population. The procedure provided an option for patients who previously had no options for missing labrums. We will continue to track these patients to determine the long-term success of the treatment.

**Midterm Outcomes after Arthroscopic Hip Surgery for Femoroacetabular Impingement**

Few studies have documented patient-centered outcomes of modern hip arthroscopy. Most studies are two-year outcome studies. In a study that was the largest of its kind, we published midterm outcomes on patients following arthroscopy for femoroacetabular impingement (FAI). We gathered follow-up data on 466 out of 559 patients who had surgery between 2005 and 2008. Before surgery, all patients had persistent pain and disability due to symptomatic FAI. In addition, all patients completed a trial of non-operative treatment including physical therapy and medication of their pain to allow activity, which was ineffective. Patients were between the ages of 18 and 77. Only 16 percent of the patients with no or limited arthritis required total hip replacement, at an average age of 73 years. Patient-centered outcomes were collected at a mean of 73 months following arthroscopy. Postoperatively, excellent outcomes were seen in patients with preserved joint space after hip arthroscopy for symptomatic FAI at a minimum of five years.

This study showed that durable and successful long-term results are achievable after hip arthroscopy to treat symptomatic FAI. Hip arthroscopy for FAI resulted in significantly better outcomes and activity level at a minimum of five years follow-up in patients with limited osteoarthritis. “These results highlight the importance of Dr. Philippon’s preoperative patient selection criteria, the goal of which is to perform arthroscopy when symptoms are mild in order to prevent early conversion to arthroplasty and thus ensure excellent clinical results for patients.”

**Performance Outcomes in Professional Hockey Players Following Arthroscopic Microfracture of the Hip**

Several studies have reported that professional athletes can return to play following hip arthroscopy. There are many different causes of hip pain that may lead an athlete to arthroscopic surgery. Damage to the articular cartilage of the hip is common in the high-demand athlete, especially those who are contact athletes. The number of professional hockey players requiring hip arthroscopy has increased over the last several years. This has led to the question, “Can professional hockey players return to hockey following microfracture to treat articular cartilage defects?”

Microfracture is the most commonly accepted treatment method for cartilage lesions, and it has been shown to be relatively inexpensive and to produce reliable results.

We studied 17 male professional hockey players who had microfracture. There were four centers, five wings, five defensemen, and four goalies. They played between two and 17 seasons prior to microfracture. Eighty-two percent of the players returned to competition at their previous level of play. Return to play was dependent on when players had surgery. Players who had surgery in the off-season or the end of the current season returned to professional play the upcoming season, and players who had surgery at the beginning of the season returned to play the same season. The number of games played in the preoperative season was on average 68, compared with 56 in the postoperative season. Shooting percentage in non-goalies was 11 percent before surgery and 10 percent after surgery. The average number of goals against for goalies was 3.6 before surgery and 3.6 after surgery. When these players were compared to age-matched players who did not have surgery, their statistics were similar. Following surgery, the players averaged 25 minutes on ice and the non-surgical controls averaged 26 minutes on ice. The average number of goals in the treatment group was 11.8 and in the control group was 12.6. For goalies in the treatment group, save percentage was 89 percent, while the control group save percentage was 90 percent.
This study showed that professional hockey players with cartilage defects treated with microfracture can return to hockey and return to the same elite performance level following an arthroscopic microfracture procedure when compared with pre-injury outcomes and controls.

Outcomes Following Microfracture in Grade 3 and 4 Articular Cartilage Lesions of the Ankle

Articular cartilage lesions of the ankle joint are a common cause of ankle pain and disability. These cartilage defects are usually the result of trauma, such as ankle sprains or fractures. Up to 50 percent of acute ankle sprains and 73 to 80 percent of ankle fractures will result in some type of cartilage damage. An untreated articular cartilage defect is a significant risk factor for the development of ankle osteoarthritis (OA).

Various treatment methods have been described for articular cartilage lesions of the ankle, which have also been commonly referred to as osteochondral lesions of the talus (OLTs) when occurring on the talus. Non-operative treatment options include immobilization with casting; walking boots or braces; non-steroidal anti-inflammatory drug (NSAID) therapy; activity modification; corticosteroid injections; and more recently, hyaluronate and platelet-rich plasma (PRP) injections. Due to poor results with these non-operative treatments, surgical treatment is recommended.

Microfracture has been shown to be a relatively low-cost, low-risk procedure with good to excellent results in both the knee and the ankle. The microfracture technique for cartilage defects of the knee was developed by Dr. J. Richard Steadman in the 1980s. Microfracture surgery of the knee has been well documented, reporting functional and symptomatic improvement in approximately 67 to 95 percent of patients. However, the microfracture technique in the ankle has been less thoroughly studied. We conducted a study to document outcomes following microfracture of the ankle.

All patients 18 years or older who underwent ankle microfracture surgery at The Steadman Clinic for the treatment of an articular cartilage lesion were included in this study. Forty patients underwent microfracture for the treatment of an articular cartilage lesion of the ankle. Detailed surgical data were documented at the time of surgery. Patients were asked to complete a subjective questionnaire at a minimum of one year following ankle surgery and each year thereafter. Outcome measures included the Foot and Ankle Disability Index (FADI) to document function, the Lysholm score to document function, and the Tegner activity scale to document activity level and patient satisfaction with outcome.

The Lysholm score (0-100, 100=highest) and Tegner activity level (0-10, 10=highest satisfaction) are common scoring systems utilized to evaluate outcomes of arthroscopic knee surgery. The Lysholm score measures symptoms and function. The Tegner activity level categorizes individuals based on the activities in which they participate.

The Foot and Ankle Disability Index (FADI) is a region-specific self-report of function. This index was designed to assess functional limitations related to foot and ankle conditions.
Four patients (10.5 percent) required another surgery after the initial microfracture surgery. Ninety-four percent of patients completed a questionnaire. The average Lysholm score was 74 out of 100. The average FADI score was 77 out of 100. Average Tegner activity scale was four out of 10, which demonstrates a recreational athlete. Median patient satisfaction with outcome was eight out of 10.

In our study, 30 percent of patients had previous ankle surgery and more than half of patients who were treated with ankle microfracture had chronic ankle injuries. Patients who had previous ankle surgery had lower outcome scores, as did patients who had a longer amount of time from ankle injury to surgery. The most important finding in this study is that patients were highly satisfied with their operative outcome. This study supports the use of microfracture for treatment of articular cartilage lesions of the ankle.

**Return to Play in Athletes Following Ankle Injuries**

The decision to allow an athlete to return-to-play (RTP) following an ankle injury is a multifactorial process—involving both physical and psychological parameters. There is limited research that provides guidelines to assist in the decision to allow an athlete to safely RTP. The ankle team at COOR reviewed the current literature and the functional tests that we use in our institution. The functional tests used include: The Dorsiflexion-Lunge Test (Figure 1), Star Excursion Balance Test (SEBT) (Figure 2), Agility T-Test (Figure 3), and Sargent/Vertical Jump Test (Figure 4).

Dorsiflexion (Figure 5) of the ankle is necessary for a normal gait, climbing stairs, and rising from a squatting position. Patients who can’t move their ankle in this motion are at increased risk for injury and have limitations in normal functional activities. The Dorsiflexion-Lunge Test is a test of range of motion at the ankle while the patient has their weight on the ankle. If a patient has restriction in testing, then this implies stiffness in dorsiflexion. This makes squatting and leg press exercises challenging. To compensate for this loss of motion, athletes may have exaggerated hip flexion and inhibition of knee flexion, and the foot will be observed to rise from the floor. In assessing treatment changes, weight-bearing measures are more likely to detect treatment effects than non-weight-bearing measures.

Balance can be defined as the ability to maintain the body’s center of gravity within the base of support. Balance is a crucial element of most sports, and loss of proprioception is a risk factor for reinjury. The SEBT examines an athlete’s ability for unilateral balance and dynamic neuromuscular control, and requires strength, flexibility, and proprioception. The patient is required to maintain a base of support with one leg while reaching maximally in defined directions with the contralateral leg. They must reach as far as they can while maintaining
SHOULDER STUDIES

Clinical and Structural Outcomes after Arthroscopic Single- Versus Double-Row Rotator Cuff Repair: A Systematic Review

Rotator cuff tears are a significant source of shoulder pain and disability, and account for more than one million physician visits per year in the United States. As our population ages, the frequency of rotator cuff tears has steadily increased, which in turn has increased the demand for arthroscopic rotator cuff repairs, which have been proven to relieve pain and improve function. Furthermore, this increased demand has led to the rapid evolution of repair techniques that often outpace the development of solid clinical data, which are often used to make informed clinical decisions. As a result, many studies that evaluate rotator cuff repair techniques suffer from low patient numbers and conflicting results.

One controversy in the treatment of rotator cuff tears is over the best way to repair the rotator cuff tear. Some surgeons use just one row of repair sutures and some use two rows (Figure 1). Biomechanical evidence suggests that two-row repairs are stronger. However, only few clinical studies have shown that the patients have better outcomes when they have a two-row repair compared with a one-row repair.

To evaluate the research that has already been done on one-row versus two-row repairs, researchers at the Steadman Philippon Research Institute recently performed a systematic literature review. High-level studies that compared the patient outcomes and imaging results following arthroscopic rotator cuff repair using either a one- or two-row technique were chosen for review. Seven studies were identified and included in the review. All reported

SYSTEMATIC REVIEW

Systematic review is a method of research in which the results from multiple similar studies are considered together to arrive at an overall conclusion regarding a particular question. This approach is typically used when the results from numerous existing studies conflict with one another, with the goal of condensing all of the available information down to a single study with a more decisive conclusion. In some cases, it may be appropriate to combine all of the actual data points from each study in order to calculate the overall results (this is called a meta-analysis). While a standard systematic review is appropriate for some research questions, a meta-analysis may be appropriate for others.

To perform a systematic review, online medical research databases (such as PubMed.gov) and specific journal websites are searched using a predefined set of keywords related to the research question. Each record that is retrieved from this search is thoroughly evaluated to determine whether it should be included in the study according to certain previously-named inclusion criteria. The research methods, results, and conclusions are obtained from each included study, and this data is managed and presented in an appropriate manner so that the reader can quickly review all of the available literature regarding the original research question. This type of research must be performed using a set of published rules and guidelines that ensure that the study was performed 'systematically' (i.e. using a standard method) to avoid potential sources of bias that may alter the overall results.

Figure 1: (A) One-row repair. (B) Two-row repair.
outcomes scores and imaging-diagnosed re-tears for both the one- and two-row groups were documented. Using the data from each study, researchers identified several important clinical characteristics for both one- and two-row repairs.

Although there were no differences in patient outcomes scores between the two techniques, the one-row group demonstrated a significantly increased rate of imaging-diagnosed re-tears after two years. This information may suggest that one-row repairs do not hold up as long. In addition, these results indicate that the presence of a re-tear may not always result in increased symptoms or outcomes scores reported by the patient. Other studies have shown that rotator cuff tears may only become symptomatic more than two years after their initial appearance. Taken together, researchers believe that a follow-up period of two years may not be adequate to detect changes in patient symptoms for those who have sustained an imaging-diagnosed re-tear. At the Steadman Philippon Research Institute, we continue to track clinical outcomes in patients who have had rotator cuff tears for many years after their surgery. The data from our registry will help answer these questions in the future as we continue to collect long-term follow-up information.

**Patient Expectations prior to Arthroscopic Shoulder Surgery: Correlation with Patients’ Reasons for Seeking Treatment**

What a patient expects from his or her treatment has been shown to influence the results of treatment. In other words, worse outcomes and low patient satisfaction can result if patients have expectations that are either too high or too low. Studies have demonstrated increased satisfaction after surgery in patients who had expectations similar to those of their surgeon as a result of improved preoperative education. We performed a study to evaluate patient expectations prior to arthroscopic shoulder surgery and to correlate them with preoperative symptoms, function, and the reasons the patient decided to seek treatment. From our data registry, we identified 313 patients with completed expectation questionnaires who went on to arthroscopic shoulder surgery.

The three most important expectations among all patients were the ability to participate in sports, to achieve their pre-injury level of function, and to improve range of motion. Patients with more expectations were more likely to have more symptoms and worse function preoperatively when compared with those with fewer expectations. The study also showed that patients who had shoulder dislocations had a different expectation profile than the rest of the patients. In addition, more than 50 percent of the patients in this study were over 50 years of age, indicating that a return to sporting activities and living an active lifestyle have become increasingly important in the ‘baby boomer’ population.

**Complications Following Anatomic Fixation and Reconstruction of the Coracoclavicular Ligaments**

The coracoclavicular ligaments connect part of the clavicle (collar bone) to part of the scapula (shoulder blade). These ligaments can become torn when the shoulder is injured, resulting in significant pain and deformity. These types of tears have been fixed surgically for many years. However, most of the older techniques resulted in a wide array of complications following surgery. Newer techniques have been developed to fix these tears and to improve patient outcomes by minimizing the risks for complications that were seen in the past.
On the other hand, new techniques can also introduce new, unique complications. We performed a study to determine which complications were associated with these newer techniques and to evaluate the effect that these complications may have had on patient outcomes. A query of our data registry resulted in a study group of 59 patients. All but three were males and most were injured during snow sports or cycling. About 23 percent of these patients had a complication that required a second surgery. There were no differences in outcomes between those patients who had a complication and those who did not, but patients who had a complication were less satisfied.

This study emphasizes the importance of both patient-centered outcomes and patient satisfaction on the overall treatment results. Although newer techniques have been developed to more closely mimic normal anatomy, it is most important to document how patients respond to these treatments.

RAISING MATTHEW: MARY ANTOINE’S PERSPECTIVE ON AN OLYMPIAN’S SUCCESS

Mary Elise Antoine is an author, cultural historian, and storyteller in Prairie du Chien, Wisconsin. She has three children. The oldest is Elise, who lives with her husband on a family farm in Iowa and is a high school social studies teacher. Nicholas is a government relations assistant with a consulting group in St. Paul. Matthew is the youngest—now an Olympic medalist and a national champion in men’s skeleton. Here are Mary Antoine’s reflections about raising Matthew.

EARLY SIGNS
“At an early age, Matthew wanted to go down a sliding hill standing up on his sled. Of course, all I could envision was Matt falling off and hurting himself, so I tried to get him to stop. It didn’t work.”

DETERMINATION
“What was noticeable in Matthew as a child was his determination. He would decide to do or make something. He would plan it out in his mind how to construct it and how it would work. He made a three-dimensional model of the solar system. He tried to invent an automatic dog-washing machine. He would become frustrated, but he would never quit. He later made recommendations to the USA Bobsled and Skeleton Federation regarding a new sled being developed.”

BEHAVIOR
“From an early age, my children knew what was expected of them regarding behavior in the family and in public. They had responsibilities at home and they knew they were expected to help my parents and elderly neighbors. The first job all three of my children had was bussing tables at a local restaurant. It taught them responsibility, how to take orders from others, and how to work with a variety of people.”

THE IMPORTANCE OF EDUCATION
“When Matthew came to me as a senior in high school and told me he wanted to compete in skeleton, I never had a second thought. But I made one stipulation. He had to attend college while he learned and mastered skeleton. (Matt’s brother and sister both have master’s degrees, as does Mary.) It took Matthew six years of classes, assignments, and tests while competing at the national level, but he has a degree in sports management.”
Who would want to slide on an ice track, headfirst more than 1,500 yards downhill on a 70-pound steel sled at speeds near 80 miles per hour?

Matthew Antoine of Prairie du Chien, Wisconsin, would, and he has been doing it for the past 12 years. He capped his best season ever by becoming the first U.S. athlete to earn a medal at the Olympics since 2002 and by setting a track record in his win at the Nationals.

A few hours after his victory in Lake Placid, he spoke with SPRI News about his life and his career.

SPRI News: Is your life back to normal yet?
“I doubt that it will ever be as normal as it was before winning the bronze medal at the Olympics and the National Championships, but things will start to settle down sooner or later.”

SPRI News: Why did you choose this sport?
“People often ask us if we are crazy. We’re not crazy, but anyone who does this sport has to have a passion for speed. Growing up, I liked watching auto racing with my dad and my brother. I had a go-cart when I was a kid. I was convinced I was going to be a race car driver, but that didn’t work out. I liked anything that went fast and always enjoyed winter sports. Skeleton brought all of those things together. After my first run down the track, I knew it was something I wanted to do.”

SPRI News: When did you start?
“I started competing when I was in high school and continued while I was in college, but there are only two tracks in the United States. In college, I tried to stay close to the one in Lake Placid.”
SPRI News: What is a typical year of training and competition?
“The season lasts from October until March. We train most of the year. I’m taking about a two-month break after this past 2013-2014 season and will begin ramping it up again in mid-May. We train like track and field athletes.”

“The Skeleton National Team trains at the U.S. Olympic Training Center in Colorado Springs, where we have living quarters and access to the facilities, coaches, sports medicine services, and sports nutritionists. It’s a six-day week from 9:00 in the morning to approximately 4:00 in the afternoon.”

“During our summertime training, we really focus on the push-start. At this level, everyone is experienced. They all have the equipment, driving ability, and aerodynamics, but the push-start can make the difference.”

(The push-start is when the competitor pushes his or her sled from a standing start as fast as possible over 30-35 meters—think of sprinting from the goal line to the 30-yard line on a football field—before getting onto the sled.)

SPRI News: What kinds of injuries typically affect skeleton athletes?
“Our injuries get compared to those in contact sports. Bumps, bruises, contusions, ice burns, and concussions, but I’ve never had a concussion.”

SPRI News: How did you come into contact with Dr. Peter Millett at The Steadman Clinic?
“He was recommended by our team physician and by a teammate who had been treated by Dr. Millett.”

[Dr. Millett continues to use techniques developed and refined at the Steadman Philippon Research Institute.]

SPRI News: What was his diagnosis?
“My knee was beyond a point where it would heal on its own. The patellar tendon had begun to break down and a third of it was torn off. I had scar tissue, damaged cartilage, and a hematoma that had formed under the tendon.”

SPRI News: Why did you choose to have the surgery in Vail?
“I was looking for a positive prognosis following surgery. It was July and the season was going to start in October. Eighteen months after that, I wanted to be ready for the Olympics. Dr. Millett was positive about me being able to compete not only in the upcoming season, but for the rest of my career.”

SPRI News: What procedures did he perform?
“He removed the middle third of my patellar tendon, cleaned out scar tissue, repaired the damaged cartilage area, removed the hematoma, and drilled two holes through the patella to increase blood flow.”

SPRI News: How would you describe your overall experience?
“Absolutely amazing. Start to finish, I was really impressed with how they approach things. They were thorough in what they did. They were realistic about what needed to be done after the surgery, but at the same time very aggressive about getting me back to sports performance.”

“I would absolutely, hands-down, recommend Dr. Millett, The Clinic, and the Research Institute to other people and other athletes. It is the most professional and thorough medical provider I’ve ever experienced.”

SPRI News: How is your knee now?
“It feels amazing—better than it did two years before surgery. I have no restrictions, and my outcomes in skeleton have been great since the operation.”

SPRI News: You’ve overcome some pretty serious obstacles to become an Olympic athlete and national champion. What message do you have for young athletes who might have Olympic aspirations?
“Stay positive and focused. Everyone who has ever been successful at this level has hit rock bottom at some point. Keep your eye on the goal and be persistent. Don’t let the down times keep you down. Figure out a way to battle back.”
The Department of BioMedical Engineering aims to help physicians improve their practice of orthopaedic sports medicine by conducting research that can be directly implemented to improve patient care. Our multidisciplinary laboratory utilizes quantitative, analytical, and innovative methods to answer questions that arise from collaboration with clinical care, world-renowned medical doctors, and educational programs.

By promoting and sustaining a highly collaborative environment, we conduct research with direct and immediate applications to orthopaedic care in order to ensure patients receive evidence-based treatment proven to result in superior outcomes. By emphasizing bench-to-bedside research, we help active people from all walks of life and all athletes—from elite competitors to weekend warriors—maintain and enhance their athletic performance, health, and quality of life.

**GOALS AND METRICS**

In 2014, the Department of BioMedical Engineering expanded its collaboration with physicians, academic institutions, and corporate entities around the world. Along with expansion and collaboration, the success of research and education within the Department is measured by: 1) number of publications in high-impact, peer-reviewed journals, 2) presentations given at both national and international conferences that attract diverse audiences of physicians and scientists, 3) awards that validate research excellence, impact, and overall contribution to the fields of orthopaedic and sports medicine, and 4) community outreach programs that support advances in medicine through innovative teaching and mentorship.

**ACCOMPLISHMENTS**

Since 2009, the yearly number of publications produced has continued to increase. In 2014, the Department has already set a new record for the number of articles accepted for publication and submitted for review. In 2013 alone, 22 articles originating from research conducted in the Department of BioMedical Engineering at SPRI were published in high-impact factor journals. Each publication was cited in the prestigious National Library of Medicine (PubMed). Notably, three of those articles were published in a single issue (December 2013) of *American Journal of Sports Medicine*—the journal ranked number one in all of orthopaedic surgery.

These three *AJSM* articles, now informally referred to at SPRI as the ‘hat trick’ issue, illustrate that top-ranked journals pay attention to the research generated by the Department, allowing our findings to reach surgeons around the world.

Additionally during 2013, two articles were published in the *British Journal of Sports Medicine*, while others appeared in publications such as the *Journal of Orthopaedic Research* and the *Journal of Bone and Joint Surgery and Knee Surgery, Sports Traumatology, Arthroscopy*.

During the past year, 12 podium and 17 poster presentations were given at high-impact conferences, including those of the American Academy of Orthopaedic Surgeons, the International Society for Hip Arthroscopy, the American Orthopaedic Foot & Ankle Society, the American Orthopaedic Society for Sports Medicine, and the International Society of Arthroscopy,
Knee Surgery & Orthopaedic Sports Medicine. Presentations were given by BioMedical Engineering researchers to audiences around the world at conferences in the United States of America, Canada, Europe, Africa, and South America.

Through a partnership with the Department of BioMedical Engineering, sports medicine fellows conducted research and received distinguished awards including the Albert Trillat Young Investigator’s Award (Dr. Jeff Padalecki), presented by the International Society of Arthroscopy, Knee Surgery & Orthopaedic Sports Medicine, and the Richard N. Villar Trainee Excellence in Clinical Research Award (Dr. Jeff Nepple), presented by the International Society for Hip Arthroscopy.

Additionally, a research assistant in the Department received the prestigious Excellence in Research Award (Nicholas Kennedy), presented by the American Orthopaedic Society for Sports Medicine.

Moreover, our efforts have expanded beyond the research and medical realms and resonated throughout our local community. In January, Department Director Coen Wijdicks, Ph.D., was named a finalist for Young Professional of the Year, sponsored by the Vail Valley Partnership.

COLLABORATIVE EFFORTS

The Department collaborates with local, national, and international institutions, both academic and corporate, including:

- The United States Olympic Committee
- American Orthopaedic Foot & Ankle Society
- Arthroscopy Association of North America
- Ceterix Orthopaedics, Inc.
- University of Oslo, Norway
- Aarhus University in Denmark
- University of Queensland, Australia
- DePuy Synthes Trauma Division of DePuy Orthopaedics, Inc.
- Instituto Brasil De Tecnologias Da Sade in Brazil
- Colorado State University
- Vail Valley Medical Center
- Vail Mountain School
- Eagle County School District
- Arthrex, Inc.
- Össur, hf
- Smith & Nephew, Inc.

OUTREACH

The Department of BioMedical Engineering, in collaboration with all SPRI departments, participates with the Education and Public Outreach Committee (EPOC) (pg. 62) in coordinating SPRI laboratory visits for students, speaking at Eagle County schools, mentoring student projects, participating in school science fairs, and providing internships to young members of the Vail Valley community. In addition, through the EPOC Science Club initiative, the Department provides Eagle County high school students an opportunity to conduct innovative scientific research under the mentorship of science teachers and professional scientists. Combined, the SPRI outreach programs reach an estimated 500 students annually.

PROJECTIONS

The Department will continue to be goal focused and pursue our passion for bench-to-bedside research through embodying the SMART model for goal achievement. Research initiatives will be Specific, Measurable, Achievable, Relevant, and Time-bound. Expanding collaboration with local, national, and international institutions, continuing education that benefits students, surgeons, and the Institute, and consistently aiming to align their work with their core values will allow the Department to continue to achieve our goals while pursuing and applying our passion for advancing patient care through translational research.


The two articles are prominently displayed in the table of contents: “Epidemiology, identification, treatment and return to play of musculoskeletal-based ice hockey injuries,” Robert F. LaPrade, Rachel K. Surowiec, Ada N. Sochanska, Brandon S. Hentkowski, Brandie M. Martin, Lars Engebretsen, and Coen A. Wijdicks;

"Improving Outcomes for Posterolateral Knee Injuries" by Robert F. LaPrade, M.D., Ph.D., is the lead article in the January 4, 2014, online and April print issue of the highly regarded Journal of Orthopaedic Research.

The research and subsequent publication resulted in the competitive and prestigious 2013 Orthopaedic Research and Education Foundation Clinical Research Award, referred as the “Orthopaedic Nobel Prize.”

“This award solidly validates our research strategy of defining the anatomy, developing improved means of diagnosing a problem, redefining the clinically relevant biomechanics, developing improved radiographic diagnostic measures, developing biomechanically validated ligament reconstructions, and then validating these reconstructions in patient outcomes studies,” said Dr. LaPrade.

The posterolateral corner of the knee stabilizes the joint. Posterior cruciate ligament injuries from external trauma or hyperextension are difficult to diagnose and treat and can be debilitating and career-ending for gymnasts and other athletes who play soccer, basketball, or football. However, patient outcomes following treatment have significantly improved as a result of Dr. LaPrade’s research.

Dr. LaPrade’s collaborators on this paper included Lars Engebretsen, M.D., Ph.D. (University of Oslo, Norway), Steinar Johansen, M.D. (University of Oslo), Chad Griffith, M.D. (University of Minnesota), Benjamin Coobs, M.D. (University of Minnesota), and Andrew Geeslin, M.D. (Western Michigan University).

SURGICAL SKILLS LABORATORY

KELLY R. ADAIR, DIRECTOR

An integral part of sports medicine surgery is mastery of operating abilities. Have you ever wondered how an orthopaedic surgeon becomes proficient in his or her expertise of surgery? Just as pilots may use a flight simulator, imagine the surgical skills lab as a surgery simulator for orthopaedic surgeons that precisely mimics the operating room, with the same equipment and instrumentation. The Surgical Skills Lab allows surgeons and other sports medicine professionals to practice in an environment that closely replicates the operating room. Our reputable surgeons and facilities have attracted medical specialists from all over the world to train and advance their techniques through hands-on cadaveric specimen training. We’re applying what we have learned through our inventive research projects by educating surgeons in these new techniques.

Year-to-date, we’ve hosted over 170 labs, which include 28 for various medical device companies and the remaining 142 for our MD fellows, ATC fellows, and other internal staff. We can expect hundreds of surgeons to come through our lab annually, and as many as 100 surgeons in a weekend. We are confident that increased surgeon training, particularly as it relates to our current research concepts and techniques, correlates with improved outcomes for the patients in the operating room.
Imaging Research develops and evaluates noninvasive imaging techniques of the joints for the purpose of directing and monitoring clinical treatment and outcomes, and to enhance the clinical relevance of research conducted in the Center for Outcomes-Based Orthopaedic Research (COOR), the Department of BioMedical Research, and the Center for Translational and Regenerative Medicine Research.

In 2013, collaboration with national, international, public, and private research and academic entities continued to emerge as a focus of Imaging Research efforts. Colorado State University, Siemens Medical Solutions USA, the University of Queensland (Australia), and the Commonwealth Scientific and Industrial Organization in Brisbane, Australia, are among the institutions currently coordinating their efforts with the work of Imaging Research.

**STAFF**

Imaging Research personnel and initiatives are supervised and directed by Dr. Ho.

Imaging Research continues to include and appreciate the contributions of the Griffin Visiting Scholar for Clinical Sports Medicine MRI. This fellowship is sponsored by the Kenneth and Anne Griffin Foundation. Coley Gatlin, M.D., began his service in this capacity in August of 2013 and completed his fellowship in July 2014.

Katherine Wilson, M.Sc., completed her work as a research engineer and now serves as an SPRI research consultant, focusing on Imaging Research.

**TECHNOLOGY**

The Imaging Research data registry continued to expand in 2013 to include approximately 300 new cases per month. A tablet-based data collection system developed by the Center for Outcomes-Based Orthopaedic Research made the process less time consuming and more efficient. Collection of MRI data now includes all knee, shoulder, hip, and foot/ankle patients.

**RESEARCH AND COLLABORATIVE EFFORTS**

Imaging Research continued its work to quantify imaging diagnoses of articular and soft tissues. That investigation has now been extended to include ligaments and tendons, including the mapping of tendon properties in the rotator cuff and peroneal tendons in the ankle. Imaging personnel have also begun the process of mapping posterior the cruciate ligament (PCL) properties in patients with and without symptoms of PCL injuries.

Siemens has continued to collaborate with SPRI on quantitative magnetic resonance imaging (MRI) of articular cartilage, focusing on the knee and hip. Siemens was scheduled to meet with SPRI and Imaging Research personnel in 2014 to discuss the development of new clinical quantitative imaging initiatives.

Efforts continued with Colorado State University to obtain histologic data (of microscopic structure tissue) obtained through studies of the hip.
CSU has conducted its research by analyzing specimens of cartilage waste products obtained from hip arthroscopies conducted by Dr. Marc Philippon at The Steadman Clinic. The histologic data obtained in specimens from surgical procedures can be compared with preoperative imaging biomarker values to further the understanding of and validate the noninvasive quantitative MRI of articular cartilage health. One phase of that research has been completed and the findings were to be submitted for publication in 2014. CSU has also collaborated with SPRI on other imaging and mapping initiatives.

2013 saw an extension of the collaboration with the University of Queensland and the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia. Working with the institutions, Imaging Research is examining the role of MRI for modeling bone and soft tissues. Bone modeling has traditionally used computer tomography (CT), but it cannot model soft tissue and it involves the risk of exposure to radiation. The goal of the new research is to find ways to conduct bone modeling based on MRI data that will be comparable and consistent with CT data, but safer.

**PROJECTIONS**

Imaging Research will continue its efforts to expand the SPRI imaging data registry. It will also expand its work with other departments at SPRI, as well as with institutions around the world, to make its findings regarding biomarker and other quantitative imaging research more consistent, more reproducible, and more applicable for clinical use.

**VISITING SCHOLARS PROGRAM BRINGS GERMAN PHYSICIAN TO THE INSTITUTE**

*Dr. Ulrich Spiegl: Destined for a Career in Sports Medicine from the Start*

By Jim Brown, Ph.D.

The series of events that resulted in Ulrich Spiegl becoming a European Visiting Scholar at SPRI began two generations before he was born.

“My father and my grandfather were physicians,” says Dr. Spiegl. “I probably began thinking about being a doctor when I was nine or 10, so that was pretty much my goal all of the time. It always seemed to be part of the conversation in our family.”

There were many other factors that eventually led him to Vail and SPRI, where he began his one-year fellowship in January of 2013. He had played soccer and tennis. He was a mountain biker and skier. Although his work now begins before daylight and often ends after dark, he still works out four or five days a week.

He learned to speak English in Germany and improved his language skills during a two-year exchange student program at Raytown High South, near Kansas City. He traveled to California, New York, and many states in-between, including Colorado. He loves America.

**MULTIPLE SPECIALTIES**

But there’s more. After earning his Doctor of Medicine degree from Technical University in Munich, he also received specialty certification in orthopaedics and traumatology, emergency medicine, special trauma surgery, and sports medicine.

Dr. Spiegl has always had a strong interest in research, as evidenced by more than 20 articles already in-press or published in the world’s leading orthopaedic journals, including the *American Journal of Sports Medicine*, *Spine*, and the *Journal of Elbow Surgery*.

**ARTHREX SPONSORSHIP**

While participating in a fellowship program at the University of Leipzig, he read about SPRI’s European Visiting Scholar Program. The program was developed and sponsored by Arthrex, Inc., an orthopaedic medical device company. Arthrex’s founder and president, Reinhold Schmieding, has had a long-time interest in education.
“We are proud to work with these young visiting scholars,” says Robert F. LaPrade, M.D., Ph.D., director of the International Scholar Program. “These doctors are already making an impact on their respective home countries, and we expect them to become the leaders of a new generation of sports medicine scientists.”

BUMP IN THE ROAD

Then came a bump in Dr. Spiegl’s career path. By the time he got the information, another physician had already been selected as the 2013 European Visiting Scholar.

No problem. The person selected had to cancel. Dr. Spiegl, with the approval of his supervisor at the University of Leipzig, recommendations from prestigious physicians in Germany, and support from the Society for Arthroscopy and Joint Surgery, applied for the position. Two weeks later, back on the fast track, he was notified that he had been accepted, and four months later he began his work in Vail.

Dr. Spiegl’s host family during his exchange student days in Missouri had moved to Denver—close enough for regular visits. Another sign.

“Once accepted, I did more homework,” recalls Dr. Spiegl. “I knew about Dr. Steadman because of the work he had done with famous soccer players and other athletes. He is very well known in Europe. But I was equally impressed when I learned about the other physicians and scientists at Steadman Philippon and the amount of information provided by their research.”

PRODUCTIVE YEAR

At SPRI, Dr. Spiegl spent approximately 70 percent of his time on research projects and rotated among the various departments, but he worked very closely with Dr. Millett on investigations related to the shoulder.

“I was able to be involved with four case studies, in addition to five or six additional research projects. The year 2013 was very productive for the Research Institute and I was fortunate to be a part of that effort.”

“One of the most important things I observed is the time physicians give their patients and the teamwork that exists in the Research Institute,” says Dr. Spiegl. “If people have questions, they answer them. You don’t get the feeling of being rushed. If one of the fellows or visiting scholars has an idea, it is easier to move forward with that initiative than at a bigger university or research facility. Those are just a couple of the many reasons that make Steadman Philippon such a different place.”

Dr. Spiegl completed his visiting scholar term earlier this year and has returned to the University of Leipzig. His goal is to complete the requirements for a Ph.D., continue to improve his surgical skills, and eventually return to his hometown of Murnau, a city near the southern border of Germany, to practice sports medicine. Something he was destined to do.

The European Visiting Scholar, developed and sponsored by Arthrex, Inc., has become the model for our Visiting Scholars programs.

The SPRI Visiting Scholars programs are sponsored by corporate and individual donors. Our program was developed in conjunction with Arthrex, Inc., an orthopaedic medical device company. Arthrex’s founder and president, Reinhold Schmieding, has had a long-term interest in education. Mr. Schmieding approached SPRI with an idea for educating a European orthopaedic surgeon with interest in research, committed to funding it, and the Visiting Scholars program was created. Mr. Schmieding commented, “Arthrex is pleased to contribute annually to the Institute. The sponsoring of a European research fellow exemplifies Arthrex’s commitment to orthopaedic research to advance knowledge of the global medical community and to helping surgeons treat their patients better.”

Arthrex, Inc., is annually sponsoring the European Visiting Scholars program, and due to its success, Mr. Jorge Paulo Lemann is supporting our Brazilian Visiting Scholar. These scholars learn new surgical techniques and conduct research, which is submitted for publication in leading orthopaedic journals.

“Dr. Spiegl says the research conducted at the Steadman Philippon Research Institute has had a profound effect on the practice of sports medicine in Germany and other European countries.”
EIGHT NEW PHYSICIANS INTRODUCED

Each year, a select group of orthopaedic surgeons is chosen from a field of more than 160 to participate in 12 months of vigorous training in the Steadman Philippon Sports Medicine Fellowship Program. SPRI’s goal is to prepare them to be leaders in the field of orthopaedic sports medicine for the remainder of their careers. Many go on to hold high-level faculty positions at top medical schools.

Fellows and visiting scholars are given a unique opportunity to perform research in their respective areas of interest, including BioMedical Engineering, Outcomes-Based Orthopaedic Research, Imaging Research, and Translational and Regenerative Medicine Research. The Institute currently maintains a network of approximately 200 fellows and visiting scholars in communities around the world who serve in academic positions at leading universities and in private practices.

The following are brief summaries of the accomplishments of this year’s class of eight SPRI fellows.
Anthony Cerminara, M.D.

Dr. Cerminara graduated summa cum laude from Gannon University in Erie, Pennsylvania. He attended Gannon on a football scholarship and was awarded with NCAA Division II All-Academic honors. He attended medical school at the State University of New York at Buffalo, where he graduated first in his class. Dr. Cerminara then traveled to Miami to pursue his residency in orthopaedic surgery at the University of Miami/Jackson Memorial Hospital. While in Miami, Dr. Cerminara covered the University of Miami football, baseball, and basketball teams and the Marlin baseball team, and was team physician for a local high school. He also obtained advanced training in musculoskeletal trauma at Miami’s Ryder Trauma Center. Dr. Cerminara has moved to Vail with his wife, Sarah, a dermatologist who will be working at Vail Dermatology.

Michael B. Ellman, M.D.

Raised in Bloomfield Hills, Michigan, Dr. Ellman matriculated at the University of Michigan for his undergraduate studies and medical school training, where he graduated with honors at both levels. As an undergraduate, he spent six months studying Spanish language and culture in Seville, Spain. During medical school, Dr. Ellman earned the Dean’s Commendation for Excellence in Clinical Skills and the Art of Medicine, and further developed his medical Spanish skills through work at a clinic in Guadalajara. Dr. Ellman completed his residency training at Rush University Medical Center in Chicago, Illinois. He published several research studies focused on articular cartilage biology and biochemical pathways involved in osteoarthritis, and was awarded the American Academy of Orthopaedics Baxter Healthcare Scholarship for his work and interest in hip cartilage preservation. Dr. Ellman also participated in sports team coverage for the Bulls, White Sox, DePaul men’s and women’s soccer teams, and area high school football teams. His wife, Julie, works as a pediatric nurse practitioner.

Jeffrey R. Jaglowski, M.D.

Born and raised in Erie, Pennsylvania, Dr. Jaglowski attended Mercyhurst College in his hometown, where he majored in sports medicine. Clinical experience with collegiate athletics over those years led him to certification as an athletic trainer. He pursued graduate studies at Pennsylvania State University in Hershey, where he received his Master of Science degree in anatomy and performed basic science and clinical cancer research for which he received numerous grants. He began medical school at Penn State, where he continued to foster interests in orthopaedic surgery and sports medicine. He was elected a member of Alpha Omega Alpha and graduated with honors. Dr. Jaglowski completed residency training at the Harvard Combined Orthopaedic Surgery Residency Program and served as chief resident at the Massachusetts General Hospital. He looks forward to a great year in Vail with his wife, Heather.

Jared Johnson, M.D.

Jared grew up in the mountains and skiing in Salt Lake City. He attended the University of Utah, where he studied business administration and finance. He then moved to New York City and medical school at Weill Cornell Medical College, where he was awarded the T. Campbell Thompson Award for excellence in orthopaedic surgery from the faculty of The Hospital for Special Surgery. Following medical school, he moved to Los Angeles and completed his residency training at UCLA. During residency, he was involved in several research projects and was published in journals such as The Journal of Bone and Joint Surgery, Journal of Biomechanics, and the Journal of Cellular Biochemistry. He and his wife, Nancy, are excited to head back to the mountains.

Mark Hamming, M.D.

Dr. Hamming graduated from Northwestern University in his home city of Chicago, with a B.S. in biology and a minor in Spanish. While at Northwestern, he was named MVP and captain of the swim team, received All-American honors, and competed at the U.S. Olympic Trials. Dr. Hamming obtained his medical degree at Rush Medical College, where he discovered his interest in orthopaedics. Upon completing medical school, Mark traveled to Duke University for an orthopaedics residency. Throughout his residency, he provided physician coverage for Duke’s many varsity athletic teams including football, basketball, and lacrosse. During residency, Dr. Hamming’s research focused on ACL grafts. Dr. Hamming has been joined in Vail by his wife, Lesley, and their eight-month-old son, George. Lesley Hamming, Ph.D., J.D., will start her career in Chicago as a patent attorney.

Gregory A. Sawyer, M.D.

Dr. Sawyer grew up in the foothills of western Maine and attended Colby College, where he double-majored in chemistry and biology and graduated summa cum laude. He attended Dartmouth Medical School, where he was inducted into the Alpha Omega Alpha honor society. Following medical school, Dr. Sawyer completed his orthopaedic residency at Brown in Providence, Rhode Island. During his time at Brown he served as an assistant team physician for the men’s ice hockey and lacrosse teams, as well as for the Providence Bruins. While at Brown, he was involved in multiple areas of research, including biomechanical analysis of different ACL and tibial spine reconstruction techniques, patient outcomes following elbow arthroscopy, and an epidemiologic evaluation of Toradol use in athletes. Following
WHERE ARE THEY NOW?

The graduating class of 2012–2013 Steadman Philippon fellows is busy establishing new careers in orthopaedics.

Tyler C. Collins, M.D.
Dr. Collins has joined the practice at the CORE Institute in Mesa, Colorado.

Christopher Espinoza-Ervin, M.D.
Dr. Espinoza-Ervin is practicing at the McBride Orthopedic Hospital and Clinic in Oklahoma City, Oklahoma.

Scott C. Faucett, M.D., M.Sc.
Dr. Faucett is establishing his practice at Medical Faculty Associates at George Washington University, Washington, D.C.

Edmund “Edton” A. Ganal, M.D.
Dr. Ganal has moved to Newport, Rhode Island, and is practicing at the Naval Health Clinic New England.

Jared T. Lee, M.D.
Dr. Lee is establishing his practice with the Big Horn Basin Bone and Joint clinic in Cody, Wyoming.

Jeffrey J. Nepple, M.D.
Dr. Nepple is establishing his sports medicine practice at Washington University Orthopaedics in St. Louis, Missouri.

Jack Skendzel, M.D.
Dr. Skendzel has moved to Woodbury, Minnesota, and joined Summit Orthopedics.

Nicholas A. Viens, M.D.
Dr. Viens has joined the Lexington Clinic Orthopedics—Sports Medicine Center in Lexington, Kentucky.

W. Sean Smith, M.D.
Dr. Smith is practicing at MedQuest in Greenville, South Carolina.

his residency, Dr. Sawyer completed a fellowship in orthopaedic trauma surgery at Rhode Island Hospital. Dr. Sawyer and his wife, Annah, have a three-month-old daughter, Lylah.

FOOT AND ANKLE FELLOW

C. Thomas Haytmanek, Jr., M.D.

Dr. Haytmanek graduated cum laude from Wake Forest University with a major in chemistry and a minor in physics. He then attended Jefferson Medical College in Philadelphia, closer to his hometown of Bethlehem, Pennsylvania. After graduating cum laude at Jefferson, he completed his orthopaedic surgery residency at Duke University. During his training he completed research projects published in *The Journal of Bone and Joint Surgery*, *Clinical Orthopaedics and Related Research*, and *Foot and Ankle International*. Dr. Haytmanek and his wife, Larisa, have a young daughter, Abigail.

GRiffin VISItING SCHOlAR foR CLINICAL SPORTS MEDICINE MRI

Coley Gatlin, M.D.

Dr. Coley Gatlin graduated cum laude from the University of Texas at Austin with a B.A. in biochemistry and attended the University of Texas Health Science Center at San Antonio (UTHSCSA), where he obtained his medical degree. Next, he completed a UNC-affiliated family medicine residency and primary care sports medicine fellowship in Greensboro, North Carolina. During his residency and fellowship, Dr. Gatlin provided sports coverage for several local high schools, Elon University, and the Burlington Indians (a farm team of the Cleveland Indians).

Thinking the medical training was over, he moved to Kerrville, Texas, and joined a family medicine private practice. He transitioned to full-time emergency room work after realizing he enjoyed acute care medicine and sports medicine more than the geriatric and hospital-based internal medicine required of private practice. Dr. Gatlin provided sideline sports coverage for several local high schools and Schreiner University. Also, he worked with one of the local orthopaedic surgeons to establish a Saturday morning sports clinic. Dr. Gatlin enjoyed his work as medical director for a rural health clinic in Utopia, Texas, for four years. He served one-year terms as vice president and then president of the Kerr-Bandera Medical Society in 2005 and 2006. He returned to UTHSCSA for additional residency training in diagnostic radiology and completed the training in June 2013.

THAnK YOu

A special thank you to our sponsors who make the fellowship program possible. We’d like to recognize those individuals and foundations that support the entire fellowship class through the sponsorship of Academic Chairs.

Chair sponsors of the 2013–2014 Steadman Philippon fellowship class are Mr. and Mrs. Lawrence Flinn, Mr. and Mrs. Peter Kellogg, Mr. and Mrs. Al Perkins, and Mr. and Mrs. Steven Read.

Fellowship Benefactors fund the research of one fellow for one year. Each benefactor is assigned a fellow who provides written reports and updates of his or her work. We extend our gratitude to the following individuals for their generous support: Mr. and Mrs. Milledge Hart, the Fred and Elli Iselin Foundation, Mr. and Mrs. Jay Precourt, and Mr. and Mrs. Stewart Turley.
EDUCATION
“The medical profession was the environment in which I was raised,” says Gregory Sawyer, M.D., who just completed his year as a Sports Medicine Fellow at the Steadman Philippon Research Institute. “We lived in Wilton, Maine, but my mom was an administrative assistant at the Franklin Memorial Hospital in Farmington, just a few miles away. Some of my earliest memories were functions at the hospital, and it was sort of understood that medicine was what I was going to do.”

“The two physicians I was most frequently exposed to (because of broken bones while playing sports) were my family physician and my orthopaedic surgeon. The experiences with my orthopaedic surgeon really put him on a pedestal in my mind and made me think about taking care of athletes someday.”

Sports have also been a big part of Dr. Sawyer’s life. He played basketball and soccer in high school, and went on to play soccer at Colby College, where he graduated summa cum laude with a double major in chemistry and biology.

When growing up in the northeast playing and following sports, you are a Red Sox, Celtics, Patriots, and Bruins fan. It’s not just a birthright—it’s a solemn, responsibility. “One of the greatest weeks of my life was when the Red Sox beat the Yankees in the 2004 American League playoffs,” he says. (Editor’s note: He doesn’t appear to be kidding.)

**A GOOD MATCH**

Dr. Sawyer’s medicine and sports interest began to merge during medical school at Dartmouth, where he was inducted into the Alpha Omega Honor Society. “I waivered a bit between radiology and orthopaedics, but being an orthopaedic surgeon specializing in sports medicine would give me the opportunity to be in the office and the operating room, as well as to get out and take care of players and teams. The energy of orthopaedics plus the connection with sports was a good match for me.”

After graduating from medical school at Dartmouth, he began his residency at Brown University’s Alpert Medical School. He served as an assistant team physician for the university’s hockey and lacrosse teams and for the Providence Bruins, a minor league affiliate of the Bruins.

Dr. Sawyer also completed a fellowship in orthopaedic trauma surgery at Rhode Island Hospital. There he met his wife, Annah, who was a social worker at the hospital with degrees from Union College and Columbia.

**VAIL**

The next big career move for Dr. and Mrs. Sawyer brought them to Vail, when Greg was accepted into the Steadman Philippon Sports Medicine Program. He was one of six chosen out of a highly competitive field of more than 150 applicants, and the first graduate of Brown’s residency program to be accepted into the program.

“I distinctly remember the interview process, and it was very intimidating,” says Dr. Sawyer. “I was sitting around a table with these giants of orthopaedic medicine whose articles I had been reading for several years. Now they were asking about my research, my writing, and my experiences, and telling me that they would love to have me be a part of their program.”

“When we learned that I had been accepted, Annah and I were overwhelmed,” recalls Greg. “Steadman Philippon was our first choice, and we were thrilled with the opportunity to work at SPRI and live in Vail. We both grew up Maine and Vermont, so we feel very much at home in the mountains, although the mountains there are not exactly the Rocky Mountains.”
IMPRESSIONS

“I was incredibly impressed with how well things are organized here and how much attention is given to detail by the entire staff,” says Greg. “You don’t get that at other places. Everyone was welcoming and pleasant. It’s more than a workplace relationship. They want to get to know you outside of the hospital. We were invited into the homes of Dr. Steadman and the other Steadman Clinic/SPRI physicians.”

“One of the things that sets SPRI apart is the mentorship model,” says Greg. “Whether in the office or the operating room, you are there with some of the best surgeons in the world. You get to see exactly how Dr. Millett or Dr. Clanton run their practices and you see them execute very specific skills in the operating room. At times, I had to kind of pinch myself knowing that I was in the operating room at midnight finishing up a case with Marc Philippon.”

Dr. Sawyer was one of the last fellows to complete a one-month rotation with Dr. Steadman before he retired from his surgical practice. “I think his lasting legacy will be how he cared for the patient,” observes Greg. “I’ve never worked at a place where the doctors and staff members are more invested in making patients better. They take care of people as individuals, not just patients, and that is a reflection of Dr. Steadman’s influence.”

RESEARCH

During his fellowship at SPRI, Dr. Sawyer’s primary research was conducted with Dr. Philippon and focused on different ways to repair the hip’s labrum (the ring of cartilage around the socket of the hip joint). The results of the study were presented during Dr. Sawyer’s last week as a fellow and have now been submitted to a peer-reviewed professional journal for publication.

“There is never a month that goes by that there is not at least one article written by doctors and scientists at SPRI in high-impact orthopaedic or sports medicine journals,” says Dr. Sawyer. “Sometimes there are two or three in the same journal. The number of quality research publications that come out of this Institute is incredible.”

LOOKING BACK

Dr. Sawyer has observations on other aspects of the Research Institute. Here are a few of them.

On the Surgical Skills Laboratory:

“It is unmatched. You can’t go anywhere in the country that provides this level of access to a facility where you can practice surgical techniques at almost any hour of the day. I could call Kelly Adair, the Surgical Skills Laboratory director, and tell him that I would like to have a shoulder (for example) available the next day at 4:00. He always said yes. And when I got down there, there was a very good chance that Dr. LaPrade or one of the other SPRI physicians was already there working on a new surgical technique.”

On the challenges of an SPRI Fellowship:

“It’s the unpredictable nature of the practice. It’s not just a nine-to-five job. The doctors there are taking calls all the time from college and professional coaches, trainers, athletes, and health care professionals. A high-profile athlete could be injured somewhere in the world on a Friday and we would be treating him or her the next day in Vail. That’s just the way it works in this field. You have to be flexible.”

Lessons learned:

“Three things stand out. First, I learned procedures and techniques in the operating room and labs that are on the cutting edge of orthopaedics. Second, I learned how to conduct a successful practice that takes care of patients at the highest level. And finally, I had the opportunity to establish relationships with the best orthopaedic surgeons in the world. Not just being able to learn from them, but to call them friends. It’s something that will be with me for a long time.”

On supporting SPRI:

“Donations fund programs and research that are changing the way sports medicine is being practiced. SPRI is essentially setting the medical community’s guidelines for improving patient outcomes. It is impacting orthopaedics like no other institute.”

LOOKING FORWARD

Greg and Annah Sawyer returned to New England in August. Their daughter, Lylah, will have a baby brother or sister later this year.

Dr. Sawyer has accepted a position at the Maine Medical Center in Portland, where he will serve as a sports medicine physician and trauma surgeon. His goal is to eventually establish the first orthopaedic residency in the state of Maine.

Based on what he’s accomplished as a medical student, resident, orthopaedic surgeon, SPRI fellow, husband, father, and Red Sox fan, we expect him to succeed.
For more than 25 years, the Steadman Philippon Research Institute has attracted physicians and scientists from all over the world. Now, SPRI is growing them in its own back yard.

SPRI staff members have been involved in the Vail Valley community since the Institute moved to Vail in 1990. That involvement reached a new level when the Institute’s Education and Public Outreach Committee—EPOC—began a program to inspire elementary, middle, and high school students to become more involved in the fields of science, technology, engineering, and mathematics.

SPRI Board member Senenne Philippon chairs the committee, which also includes Coen Wijdicks, Mary Goldsmith, Lynda Sampson, John McMurtry, and Megan Bryant, in addition to eight Vail Valley educators.

EPOC’s three-tiered program has been developed in partnership with the Eagle County School District, Vail Mountain School, and Vail Christian Academy. During 2013-2014, four high schools, three middle schools, and four elementary schools participated in various EPOC programs.

SPRI’s team of scientists offers tours, presentations, projects, science fairs, and internships. Here is how EPOC’s program has involved more than 500 students, beginning with those in the fifth grade:

5TH GRADE
• Tours of SPRI laboratories

6TH, 7TH, 8TH GRADE
• School visits and presentations by SPRI staff scientists
• Mentored school science fairs
• Classroom and assembly lectures
• Support for science-related projects (such as robotics competition)

HIGH SCHOOL
• SPRI Science Club
• Mentored scientific research

SPRI LABORATORY TOURS
Three SPRI laboratory tour days are set aside each year, and as many as 80 fifth graders participate in the tours in a single day, according to Megan Bryant, marketing coordinator for The Steadman Clinic.

“The children are shown the full laboratory experience by Coen Wijdicks, Ph.D., director of BioMedical Engineering and senior staff scientist, Mary Goldsmith, senior robotics engineer, and Kelly Adair, director of the Surgical Skills Laboratory, with the help of other SPRI staff members,” says Ms. Bryant.

“The tours are very interactive for the students, who get to handle some of the surgical tools and artificial bones as the scientists and physicians direct open discussions about topics such as surgical processes and how research relates to those processes.”

SPRI SCIENCE CLUB

“The SPRI Science Club is an excellent gateway to research and orthopaedic education, as well as a professional experience for the students who are interested in these fields,” says Bryant.

Two 9th-12th grade student representatives from each participating Eagle County school are selected by their respective science teachers. A theme is chosen each year to guide the club’s research, and each student team defines its own question within the scope of the club’s theme.
“Having world-class research scientists as a sounding board really gives the students a sense of validation and pride,” says Gabe Scherzer, a Vail Mountain School science teacher.

Students agree to commit a minimum of two hours per week to their science projects, and SPRI research scientists are available throughout the year to mentor the students. The student teams are required to develop research timelines, submit progress reports, and make a final report or presentation. Throughout the year, Science Club members are given the opportunity to attend research lectures at SPRI in order to expand their understanding of the research process.

“Our young scientists hold the key to the future,” says Coen A Wijdicks, Ph.D., director of the Department of BioMedical Engineering at SPRI. “These experiences allow students to use the resources they are taught in their science classes and to apply scientific methods and techniques to various topics and experiences. It is very rewarding to mentor the students and work with them on ways to better understand the dynamics behind producing an authentic experiment.”

Rachel Ledon, a student at Battle Mountain High School, has this to say about her SPRI Science Club experiences: “The EPOC Science Club allowed me to further explore my passion for science and research. With the help of SPRI’s doctors and researchers, I was challenged to explore questions and potential problems of skier safety. I practiced the scientific method, incorporating experimental procedures to find answers and possible solutions to the problem.”

Through her involvement, Rachel has become inspired to create a similar program at her school that allows students to conduct research projects on their own. “The Science Club has taught me things I couldn’t learn in a classroom,” she adds.

**WHO WINS?**

Through EPOC’s variety of activities, Steadman Philippon physicians and scientists broaden their perspective by interacting with elementary, middle, and high school students.

Students get the opportunity to meet, question, and work with world leaders in science, research, and orthopaedic sports medicine.

“We are grateful and appreciative for all The Steadman Clinic and the Steadman Philippon Research Institute do for our students and community,” says Jason Glass, Ed.D., superintendent of Eagle County Schools.

Dr. Glass, other educational administrators, and teachers throughout the Vail Valley area display the vision that makes interaction between the Steadman Philippon Research Institute and future scientists, engineers, mathematicians, and physicians possible.

*Everyone wins.*
PRESENTATIONS AND PUBLICATIONS
In 2013, principal investigators and fellows published papers in scientific and medical journals and delivered presentations to a variety of professional and lay audiences worldwide.

**2013 PUBLICATIONS**


Clanton TO, Johnson NS, Matheny LM. Outcomes Following Microfracture in Grade 3 and 4 Articular Cartilage Lesions of the Ankle. *Foot Ankle Int.* 2014;35(8):764-770.


Clanton TO, Matheny LM, Briggs KK. Foot Pathologies Associated with Decreased Activity Levels. ePoster. *AANA Annual Meeting*, San Antonio, TX, April 2013.


Clanton TO, Miscellaneou...Fractures in Athletes – Is There a Difference? AOFAS Fall Course: Sports Injuries of the Foot and Ankle, Houston, TX, October 2013.


Clanton TO, ICL Course: Problems of the Foot and Ankle and How to Tackle Them Using the Scope. AANA Annual Meeting, San Antonio, TX, April 2013.

Clanton TO, Osteochondral Lesions of the Talus. AANA Annual Meeting, San Antonio, TX, April 2013.

Clanton TO, Anterior Ankle Soft Tissue and Bony Impingement. Smith and Nephew Master’s Course: Foot and Ankle Arthroscopy, Vail, CO, February 2013.

Clanton TO, Arthroscopic Treatment in Conjunction with Fracture Care of the Ankle. Smith and Nephew Master’s Course: Foot and Ankle Arthroscopy, Vail, CO, February 2013.


Horan MP, Warth RJ, Briggs KK, Millett PJ. Association Between Rotator Cuff Pathology and the Disabilities of the Arm, Shoulder and Hand (Quick-DASH) Score: Preoperative Factors that Influence Subjective Disability. ePoster. 9th Biennial ISAKOS Congress, Toronto, Canada, May 2013.

Horan MP, Warth RJ, Briggs KK, Millett PJ. Association Between Rotator Cuff Pathology and QuickDASH Score: Preoperative Factors That Influence Disability. ePoster. AANA Annual Meeting, San Antonio, TX, April 2013.


LaPrade RF. Outcomes of Acute Repairs vs. Reconstructions for PLC Injuries. 9th *Biennial ISAKOS Congress*: Evidence-Based Treatment of Collateral Ligaments Symposium, Toronto, Canada, May 2013.

LaPrade RF. Altered Tibiofemoral Contact Mechanics Due to Lateral Meniscus Posterior Horn Root Avulsions and Radial Tears Can Be Restored with In Situ Pull-Out Repairs. ePoster. 9th *Biennial ISAKOS Congress*, Toronto, Canada, May 2013.


LaPrade RF. Program Chairman. 9th *Biennial ISAKOS Congress*, Toronto, Canada, May 2013.


LaPrade RF. How to Build a Focused Research Program: The Oslo-Minnesota-Vail Example. *Norwegian School of Sport Sciences and Department of Sports Medicine at Oslo Sports Trauma Research Center sponsored Spring Seminar at Kleivstua*, Kleivstua, Norway, May 2013.
LaPrade RF. Orthopaedic Research and Education Foundation Clinical Research Award: Improving Outcomes for Posterolateral Corner Injuries. ORS Annual Meeting, San Antonio, TX, January 2013.


LaPrade RF. Current Updates on Meniscal Root Tears 2013. University of Oslo Hospital, Oslo, Norway, May 2013.

LaPrade RF. Translational Research: From the Laboratory to the Operating Suite and Back. Vail Hip Symposium, Beaver Creek, CO, January 2013.


Millett PJ. Complete the Tear or Fix In Situ: Partial Cuff Tears and PASTA Lesion. 14th Annual AAOS/AOSSM Sports Medicine Course: Elite Athletes to Weekend Warriors, Park City, UT, February 2013.


Millett PJ. SpeedBridge Transosseous-Equivalent Rotator Cuff Repair. How to Get Reproducible Results. 30th Annual Congress of AGA - Society for Arthroscopy and Joint Surgery, Wiesbaden, Germany, September 2013.


Millett PJ. Martetschläger F, Horan MP, Rios D, Millett PJ. Complications Following Subsectoral Biceps Tenodesis with Interference Screw Fixation. ePoster. 9th Biennial ISAKOS Congress, Toronto, Canada, May 2013.

Millett PJ. AC Joint Injuries. AAOS Annual Meeting, Chicago, IL, March 2013.

Millett PJ. Biceps and Subscapularis. 5SK ICL. AAOS Annual Meeting, Chicago, IL, March 2013.

Millett PJ. Surgical Skill Wet Lab. AAOS Annual Meeting, Chicago, IL, March 2013.

Millett PJ. Surgical Options for Recurrent Shoulder Dislocations. SOMOS Annual Meeting, Vail, CO, December 2013.


Millett PJ. Advancements in Rotator Cuff Repair. Arthrex Surgical Skills Master’s Shoulder Course, Vail, CO, August 2013.


Millett PJ. SpeedBridge and SpeedFix Pearls Update. Arthrex Medical Education Center, Naples, FL, January 2013.


Millett PJ. Case Base Learning IV: Making a Bad Situation Better. Panel. AANA Fall Course, Las Vegas, NV, November 2013.


Millett PJ. Knotless Biologic Fixation of Rotator Cuff Tears with Collagen FiberTape Bridging Techniques. Focus Demonstration. AANA Fall Course, Las Vegas, NV, November 2013.

Millett PJ. Shoulder Laboratory Instructor. AANA Fall Course, Las Vegas, NV, November 2013.


Philippon MJ. CAM FAI. *AAOS/American Association of Hip and Knee Surgeons (AAHKS)/Pediatric Orthopaedic Society of North America (POSNA) Hip Preservation in the Adolescent and Young Adult*, Chicago, IL, March 2013.


Philippon MJ. Course 101 Hip Model Laboratory. AANA Fall Course, Las Vegas, NV, November 2013.


Philippon MJ. Labral Cartilage: Repair or Reconstruct? Podium. AANA Fall Course, Las Vegas, NV, November 2013.


Philippon MJ. Mini Fellowship in Hip Arthroscopy. Laboratory. AANA Fall Course, Las Vegas, NV, November 2013.


Philippon MJ, Ferro FP, Briggs KK. Arthroscopy Provides Relief of Symptoms and Functional Good Results in Patients with Primary Hip Synovial Chonstomatosis. Podium. Brazilian Congress of Arthroscopy and Sports Traumatology, Fortaleza, Brazil, August 2013.


Philippon MJ. Comprehensive Approach to Hip Preservation. Laboratory. ISHA Annual Meeting, Munich, Germany, October 2013.

Philippon MJ. How to Educate People in Hip Arthroscopy. Panel. ISHA Annual Meeting, Munich, Germany, October 2013.


Rios D, Martetschläger F, Horan MP, Millett PJ. Complications Following Subpectoral Biceps Tenodesis with Interference Screw Fixation. ePoster. AANA Annual Meeting, San Antonio, TX, April 2013.

Rios D, Martetschläger F, Horan MP, Millett PJ. Complication After Biceps Tenodesis. American Shoulder and Elbow Surgeons Specialty Course, Chicago, IL, March 2013.

Rodkey WG, Briggs KK, Steadman JR. Grade IV Patellofemoral Chondral Defects Result in Increased Patient Disability. 11th World Congress of the International Cartilage Repair Society (ICRS), Izmir, Turkey, September 2013.

Rodkey WG, Briggs KK, Steadman JR. Microfracture Clinical Outcomes Are Not Influenced by Lesion Size: A 2- to 8-Year Follow-Up Study. 11th World Congress of the ICRS, Izmir, Turkey, September 2013.


Rodkey WG, Steadman JR. Return to Sports after Meniscectomy or Meniscus Replacement. BKM ’13, Barcelona, Spain, February 2013.

Rodkey WG, Steadman JR. The Role of Platelet-Rich Plasma (PRP) to Treat Patellar Tendinitis. BKM ’13, Barcelona, Spain, February 2013.

Rodkey WG, Steadman JR. What to Do? A Chondral Lesion and a Meniscus Tear at Age 40. BKM ’13, Barcelona, Spain, February 2013.


Rodkey WG. Meniscus Tear at Age 40. BKM ’13, Barcelona, Spain, February 2013.

Rodkey WG. Outcomes After Microfracture: A 2- to 8-Year Follow-Up Study. SICOT Orthopaedic World Conference, Hyderabad, India, October 2013.


Rodkey WG. Microfracture: The Vail Experience. Technique and Lessons Learned. Vail Hip Symposium, Beaver Creek, CO, January 2013.


Grammy Award-winning country music superstar Darius Rucker headlined the “Rock the Research” summer fundraising concert to benefit the Steadman Philippon Research Institute (SPRI). The annual event was held Monday, July 14, at the Gerald R. Ford Amphitheater in Vail, Colo. This marked Rucker’s fourth appearance at the SPRI event and first since 2012.

Bruce Smith, a National Football League Hall of Fame member, was a special guest of Dr. Richard Steadman.

“As the lead singer of Hootie & the Blowfish, Rucker was one of the most popular frontmen in mainstream pop/rock during the mid-’90s. The Grammy Award-winning band charted six Top 40 hits on the Billboard 100. Rucker moved on to a solo recording and performing career, focusing primarily on country music. In 2009, he became the first African American to win the New Artist Award from the Country Music Association and only the second African American to win any award from the association.

Proceeds from “Rock the Research” and the corresponding live auction supported new research related to sports injury prevention and innovative treatments for orthopaedic injuries and musculoskeletal conditions. This includes the prevention and treatment of osteoarthritis, as well as new initiatives to prevent sports injuries in youth.”
NFL LEGEND BRUCE SMITH
SPECIAL GUEST AT SPRI’S
“ROCK THE RESEARCH 2014”

Bruce Smith, a National Football League Hall of Fame member, was a special guest to honor Dr. Richard Steadman at “Rock the Research 2014” on Monday, July 14, at the Gerald R. Ford Amphitheater.

Smith, one of the most dominant defensive players in NFL history, first met Dr. Steadman as a patient in 1992.

“I learned very quickly that there was something about Dr. Steadman that exceeds the normal doctor-patient relationship,” he says. “He has a concern for each patient that is simply special. For me, he was like a ray of sunshine that brightens the moment. He’s an accomplished and remarkable man—unique and humble—and that’s why I wanted to attend this event.”

“He also added at least five years to my career,” adds Smith, who had three microfracture procedures performed by Dr. Steadman. “He protected me. He did not let them rush me back onto the field prematurely. I couldn’t have been more blessed to have a doctor who took care of me the way he did.”

After graduating from Virginia Tech and being drafted No. 1 in 1985, Smith played in the NFL 19 years—15 for Buffalo and four for Washington. During his career, he earned “Defensive Player of the Year” honors in 1990 and 1996, was AFC Defensive Player of the Year four times, and was chosen to play in 11 Pro Bowls. With the Bills, his team went to four consecutive Super Bowls. His number, 78, has been retired at Virginia Tech.

When he was enshrined into the NFL Pro Football Hall of Fame in 2009, he credited Dr. Steadman for preserving his career.

“Dr. Steadman and his colleagues at the Steadman Philippon Research Institute are pioneers and innovators,” says Smith. “They are constantly exploring new techniques that extend the playing careers of athletes and add to the quality of life of all their patients. For what they have done for me and thousands of others, I will be forever thankful.”

Smith and his wife, Carmen, live in Virginia Beach, Virginia. Bruce is passionate about his alma mater, Virginia Tech, and attends every football game. He is a commercial real estate developer and has built a 300-unit apartment complex/hotel near the campus. Their son, Alston, is a sophomore offensive lineman for the Hokies.

SPRI IS MOST GRATEFUL TO THE FOLLOWING SPONSORS AND PARTICIPANTS:

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Dr. Randall Viola

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Mr. Jim Shpall - Applejack Wine & Spirits
John Irwin Entertainment
Larkspur
Mr. Larry Mullen
Lodge at Vail
Mountain Spirits
Newton Running
Orin Swift
Petals and Pours, LLC
Pink Monkey Solutions
Red Sky Ranch and Golf Club
Silent Partner Limousines, LLC
Silver Oak Cellars
Southern Wine and Spirits
Vail Catering Concepts
The Institute was selected by RE/MAX, LLC, the global real estate firm, to organize the 11th annual Golf Classic at Sanctuary, a premier golf resort located south of Denver.

Proceeds from the tournament support the development of new procedures and methodology to battle degenerative arthritis. The tournament was open to the public and included grateful patients and corporate supporters.

Since 2004, the Institute has raised more than $1,460,000 from this golf tournament to support its research programs.

The Institute is grateful to Mr. Dave and Mrs. Gail Liniger, owners and co-founders of RE/MAX, LLC who developed Sanctuary and created this unique opportunity for the Institute to develop and enhance relationships with those who support our mission. In addition, we wish to express our sincere appreciation to the following sponsors and participants:

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Össur Americas, Inc.
Mr. Gary Peterson
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Mr. Matt Simi
Morgan Stanley
Richard Steadman, M.D.
U.S. Bank
Mr. Norm Waite
Brian White, M.D.

**INDIVIDUAL SPONSORS**

Bledsoe Brace Company
John Feagin, M.D.
ASSOCIATES

The Institute is proud to recognize its team of associates who carry out the research and educational mission in Vail. The staff has been selected for its diverse training and background in biomechanics, engineering, clinical research, veterinary science, and computer science. Together, the staff members take a multidisciplinary approach to their work in solving orthopaedic sports medicine problems.

ADMINISTRATION

Gary Peterson
President and Chief Executive Officer
The Steadman Clinic
Steadman Philippon Research Institute

Jen Rogus
Executive Assistant to the CEO
The Steadman Clinic
Steadman Philippon Research Institute

Greg Paschke
Chief Financial Officer
The Steadman Clinic
Steadman Philippon Research Institute

Amy Ruther
Administration Director

Monica White, CPA, CGMA
Controller

DEVELOPMENT

John G. McMurtry, M.A., M.B.A.
Director

Lynda Sampson
Director of External Communications, Marketing and Communications

CENTER FOR TRANSLATIONAL AND REGENERATIVE MEDICINE RESEARCH

William G. Rodkey, D.V.M.
Director

SURGICAL SKILLS LABORATORY

Kelly Adair
Director

CENTER FOR OUTCOMES-BASED ORTHOPAEDIC RESEARCH (COOR)

Karen K. Briggs, M.B.A., M.P.H.
Director

Ashley Wilson
Data Collection Coordinator

Grant Doman
Statistician

Marilee Horan, M.P.H.
Coordinator of Upper Extremity Research

Lauren Matheny
Coordinator of Lower Extremity Research

Dawn Rossi
Administrative Assistant

Josu Greenspoon
Research Assistant

Shannon McNama
Research Assistant

Sam Moulton
Research Assistant

Ryan Warth, M.D.
Research Assistant

Nick Johnson, M.D.
Research Assistant

BIOMEDICAL ENGINEERING

Coen A. Wijdicks, Ph.D.
Director and Senior Staff Scientist

Mary Goldsmith, M.Sc.
Senior Robotics Engineer

Travis Turnbull, Ph.D.
Research Engineer

Matt Rasmussen
Research Engineer

Brady Williams
Research Assistant

Adriana Saroki
Research Assistant

David Civitarese
Research Assistant

IMAGING RESEARCH

Charles P. Ho, Ph.D., M.D.
Director

Rachel Surowiec, M.Sc.
Senior Research Scientist

Coley Gatlin, M.D.
Griffin Visiting Scholar

Elizabeth L. Carpenter, M.D.
Griffin Visiting Scholar

EDUCATION

Robert F. LaPrade, M.D., Ph.D.
Deputy Director, Sports Medicine Fellowship Program
Director, International Scholar Program

Kelly Stoycheff
Education and Fellowship Coordinator

Max Petri, M.D.
Visiting Research Scholar

Fernando Fuso, M.D.
Visiting Research Scholar

Christiano Trindade, M.D.
Visiting Research Scholar

DEPARTMENT OF TECHNOLOGY AND MULTIMEDIA COMMUNICATION

Jason Gregg
Director

Barry Eckhaus
AudioVisual/Multimedia Manager

Angelica Wedell
AudioVisual/Multimedia Technician

Jim Brown, Ph.D.
Executive Editor
INDEPENDENT AUDITORS’ REPORT

To the Board of Directors
Steadman Philippon Research Institute and Subsidiary
Vail, Colorado

We have audited the accompanying consolidated financial statements of Steadman Philippon Research Institute and Subsidiary, which are comprised of the consolidated statements of financial position as of December 31, 2013 and 2012, and the related consolidated statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the consolidated financial statements.

MANAGEMENT’S RESPONSIBILITY FOR THE FINANCIAL STATEMENTS

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

AUDITORS’ RESPONSIBILITY

Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditors’ judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditors consider internal control relevant to the entity’s preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity’s internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

OPINION

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of Steadman Philippon Research Institute and Subsidiary as of December 31, 2013 and 2012, and the changes in their net assets and their cash flows for the years then ended in accordance with accounting principles generally accepted in the United States of America.

EKS&H LLP

July 2, 2014
Denver, Colorado
Consolidated Statements of Financial Position

ASSETS

<table>
<thead>
<tr>
<th></th>
<th>December 31, 2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$ 260,739</td>
<td>$ 1,402,658</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>18,921</td>
<td>642</td>
</tr>
<tr>
<td>Accounts receivable, related parties</td>
<td>5,451</td>
<td>22,802</td>
</tr>
<tr>
<td>Contributions receivable, current portion</td>
<td>136,800</td>
<td>261,800</td>
</tr>
<tr>
<td>Prepaid expenses and other assets</td>
<td>27,189</td>
<td>977</td>
</tr>
<tr>
<td>Investments</td>
<td>5,175,573</td>
<td>4,606,283</td>
</tr>
<tr>
<td>Inventory</td>
<td>144,804</td>
<td>225,182</td>
</tr>
<tr>
<td>Total current assets</td>
<td>$ 5,769,477</td>
<td>6,520,344</td>
</tr>
<tr>
<td>Contributions receivable, less current portion</td>
<td>92,421</td>
<td>174,342</td>
</tr>
<tr>
<td>Property and equipment, net</td>
<td>2,474,880</td>
<td>3,693,322</td>
</tr>
<tr>
<td>Investment, other</td>
<td>227,050</td>
<td>227,050</td>
</tr>
<tr>
<td>Deferred tax asset</td>
<td>14,885</td>
<td></td>
</tr>
<tr>
<td>Total assets</td>
<td>$ 8,578,713</td>
<td>$ 10,615,058</td>
</tr>
</tbody>
</table>

LIABILITIES AND NET ASSETS

Current liabilities

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts payable</td>
<td>$ 157,686</td>
<td>$ 199,385</td>
</tr>
<tr>
<td>Accrued expenses</td>
<td>242,368</td>
<td>336,697</td>
</tr>
<tr>
<td>Line-of-credit</td>
<td>263,500</td>
<td></td>
</tr>
<tr>
<td>Current portion of long-term debt</td>
<td>-</td>
<td>248,847</td>
</tr>
<tr>
<td>Current portion of capital leases</td>
<td>100,790</td>
<td>433,127</td>
</tr>
<tr>
<td>Current portion of deferred rent</td>
<td>-</td>
<td>153,616</td>
</tr>
<tr>
<td>Total current liabilities</td>
<td>764,344</td>
<td>1,371,672</td>
</tr>
</tbody>
</table>

Long-term liabilities

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term debt, net of current portion</td>
<td>-</td>
<td>689,325</td>
</tr>
<tr>
<td>Capital leases, net of current portion</td>
<td>-</td>
<td>100,789</td>
</tr>
<tr>
<td>Deferred tax liability</td>
<td>-</td>
<td>6,425</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>764,344</td>
<td>2,168,211</td>
</tr>
</tbody>
</table>

Commitments

Net assets

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted</td>
<td>7,373,711</td>
<td>7,079,142</td>
</tr>
<tr>
<td>Temporarily restricted</td>
<td>440,658</td>
<td>1,367,705</td>
</tr>
<tr>
<td>Total net assets</td>
<td>7,814,369</td>
<td>8,446,847</td>
</tr>
<tr>
<td>Total liabilities and net assets</td>
<td>$ 8,578,713</td>
<td>$ 10,615,058</td>
</tr>
</tbody>
</table>
Consolidated Statements of Activities

**For the Years Ended December 31, 2013**

<table>
<thead>
<tr>
<th>Revenue Category</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributions</td>
<td>$698,898</td>
<td>$1,654,872</td>
</tr>
<tr>
<td>828,820</td>
<td></td>
<td>885,724</td>
</tr>
<tr>
<td>MRI income</td>
<td>1,048,142</td>
<td>1,790,755</td>
</tr>
<tr>
<td>Other income</td>
<td>1,048,142</td>
<td>1,790,755</td>
</tr>
<tr>
<td>In-kind contributions</td>
<td>111,071</td>
<td>201,835</td>
</tr>
<tr>
<td>3,908,654</td>
<td></td>
<td>5,350,165</td>
</tr>
<tr>
<td>Net assets released from restrictions</td>
<td>2,368,558</td>
<td>2,162,605</td>
</tr>
<tr>
<td>6,277,212</td>
<td></td>
<td>6,238,142</td>
</tr>
</tbody>
</table>

**Expenses and losses**

<table>
<thead>
<tr>
<th>Expense Category</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BioMedical engineering</td>
<td>1,487,659</td>
<td>1,537,409</td>
</tr>
<tr>
<td>Center for translational and regenerative medicine research</td>
<td>241,760</td>
<td>236,647</td>
</tr>
<tr>
<td>Surgical skills laboratory</td>
<td>996,620</td>
<td>1,184,788</td>
</tr>
<tr>
<td>Center for outcomes-based orthopaedic research</td>
<td>851,876</td>
<td>833,904</td>
</tr>
<tr>
<td>Education department</td>
<td>577,207</td>
<td>361,025</td>
</tr>
<tr>
<td>Department of technology and multimedia communications</td>
<td>304,200</td>
<td>264,393</td>
</tr>
<tr>
<td>Imaging research</td>
<td>601,782</td>
<td>767,588</td>
</tr>
<tr>
<td>Management and general</td>
<td>625,659</td>
<td>789,462</td>
</tr>
<tr>
<td>Development</td>
<td>928,356</td>
<td>720,428</td>
</tr>
<tr>
<td>6,615,119</td>
<td></td>
<td>6,695,644</td>
</tr>
</tbody>
</table>

**Other income (expense)**

<table>
<thead>
<tr>
<th>Other Income</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment return</td>
<td>578,194</td>
<td>471,317</td>
</tr>
<tr>
<td>Interest expense</td>
<td>(64,657)</td>
<td>(71,683)</td>
</tr>
<tr>
<td>513,537</td>
<td></td>
<td>399,634</td>
</tr>
</tbody>
</table>

**Provision for income tax**

<table>
<thead>
<tr>
<th>Provision for income tax</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(600,000)</td>
<td></td>
<td>(600,000)</td>
</tr>
</tbody>
</table>

**Change in net assets**

<table>
<thead>
<tr>
<th>Change in net assets</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>294,569</td>
<td>927,047</td>
<td>(917,481)</td>
</tr>
</tbody>
</table>

**Net assets at beginning of year**

<table>
<thead>
<tr>
<th>Net assets at beginning of year</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,079,142</td>
<td>1,367,705</td>
<td>8,446,847</td>
</tr>
</tbody>
</table>

**Net assets at end of year**

<table>
<thead>
<tr>
<th>Net assets at end of year</th>
<th>Restricted Unrestricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7,373,711</td>
<td>$440,658</td>
<td>$7,814,369</td>
</tr>
</tbody>
</table>

See notes to consolidated financial statements.
## Consolidated Statement of Functional Expenses

For the Year Ended December 31, 2013

<table>
<thead>
<tr>
<th>Program Services</th>
<th>Support Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>$271,939</td>
</tr>
<tr>
<td>Center for Translational Regenerative Medicine Research</td>
<td>$312,013</td>
</tr>
<tr>
<td>Surgical Skills Laboratory</td>
<td>$2,875,797</td>
</tr>
<tr>
<td>Center for Outcomes-Based Orthopaedic Research</td>
<td>$2,291,845</td>
</tr>
<tr>
<td>Education Department</td>
<td>$2,875,797</td>
</tr>
<tr>
<td>Department of Technology and Multimedia Communications</td>
<td>$2,875,797</td>
</tr>
<tr>
<td>Imaging Research</td>
<td>$2,875,797</td>
</tr>
<tr>
<td>Total Program Services</td>
<td>$2,875,797</td>
</tr>
<tr>
<td>Management and General</td>
<td>$271,939</td>
</tr>
<tr>
<td>Development</td>
<td>$312,013</td>
</tr>
<tr>
<td>Total</td>
<td>$2,875,797</td>
</tr>
</tbody>
</table>

| Salaries and benefits | $666,245 |
| Consulting and contract labor | $155,314 |
| Supplies (office, computer, lab) | $83,449 |
| Events and fundraising | $699,376 |
| Printing | $394,540 |
| Maintenance and supplies | $213,133 |
| Rent and leases | $79,788 |
| Telephone and utilities | $597,692 |
| Travel | $50,376 |
| Legal and accounting | $2,291,845 |
| Fellows | $38,680 |
| Education meetings/lectures | $1,159 |
| Direct mail/planned giving | $314 |
| Meals and entertainment | $292,487 |
| Gifts | $14,844 |
| Postage | $2,746 |
| Insurance | $98,164 |
| Meeting fees/registrations | $1,778 |
| Bank/credit card fees | $1,269 |
| Meetings (Board and SAC) | $131,494 |
| Advertising | $1,863 |
| Depreciation and amortization | $2,875,797 |
| Total | $1,487,659 |

See notes to consolidated financial statements
<table>
<thead>
<tr>
<th>Program Services</th>
<th>Support Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>Management and Development</td>
</tr>
<tr>
<td>Center for Translational Regenerative Medicine Research</td>
<td>General</td>
</tr>
<tr>
<td>Surgical Skills Laboratory</td>
<td>Total</td>
</tr>
<tr>
<td>Center for Outcomes-Based Orthopaedic Research</td>
<td></td>
</tr>
<tr>
<td>Education Department</td>
<td></td>
</tr>
<tr>
<td>Department of Technology and Multimedia Communications</td>
<td></td>
</tr>
<tr>
<td>Imaging Research</td>
<td></td>
</tr>
<tr>
<td>Total Program Services</td>
<td></td>
</tr>
<tr>
<td>Salaries and benefits</td>
<td>$ 1,537,409</td>
</tr>
<tr>
<td>Consulting and contract labor</td>
<td>$ 236,647</td>
</tr>
<tr>
<td>Supplies (office, computer, lab)</td>
<td>$ 1,184,788</td>
</tr>
<tr>
<td>Events and fundraising</td>
<td>$ 833,904</td>
</tr>
<tr>
<td>Printing</td>
<td>$ 361,025</td>
</tr>
<tr>
<td>Maintenance and supplies</td>
<td>$ 264,393</td>
</tr>
<tr>
<td>Rent and leases</td>
<td>$ 767,588</td>
</tr>
<tr>
<td>Telephone and utilities</td>
<td>$ 5,185,754</td>
</tr>
<tr>
<td>Travel</td>
<td>$ 789,462</td>
</tr>
<tr>
<td>Legal and accounting</td>
<td>$ 720,428</td>
</tr>
<tr>
<td>Fellows</td>
<td>$ 6,695,644</td>
</tr>
<tr>
<td>Education meetings/lectures</td>
<td></td>
</tr>
<tr>
<td>Direct mail/planned giving</td>
<td></td>
</tr>
<tr>
<td>Meals and entertainment</td>
<td></td>
</tr>
<tr>
<td>Gifts</td>
<td></td>
</tr>
<tr>
<td>Postage</td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Meeting fees/registrations</td>
<td></td>
</tr>
<tr>
<td>Bank/credit card fees</td>
<td></td>
</tr>
<tr>
<td>Meetings (Board and SAC)</td>
<td></td>
</tr>
<tr>
<td>Research grant</td>
<td></td>
</tr>
<tr>
<td>Advertising</td>
<td></td>
</tr>
<tr>
<td>Depreciation and amortization</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

See notes to consolidated financial statements
## Consolidated Statements of Cash Flows

For the Years Ended December 31

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cash flows from operating activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in net assets</td>
<td>$ (632,478)</td>
<td>$ (941,840)</td>
</tr>
<tr>
<td><strong>Adjustments to reconcile change in net assets to net cash (used in) provided by operating activities</strong>&lt;br&gt;Depreciation and amortization expense</td>
<td>1,298,710</td>
<td>1,356,261</td>
</tr>
<tr>
<td>Net gain on investments</td>
<td>(615,165)</td>
<td>(485,795)</td>
</tr>
<tr>
<td>Rescinded pledge</td>
<td>-</td>
<td>600,000</td>
</tr>
<tr>
<td>Amortization of deferred rent</td>
<td>(153,616)</td>
<td>(153,624)</td>
</tr>
<tr>
<td>Donated stock</td>
<td>(15,933)</td>
<td>(32,503)</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>(21,310)</td>
<td>(115,575)</td>
</tr>
<tr>
<td><strong>Changes in assets and liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>(928)</td>
<td>(668)</td>
</tr>
<tr>
<td>Contributions receivable</td>
<td>206,921</td>
<td>(18,691)</td>
</tr>
<tr>
<td>Prepaid expenses and other assets</td>
<td>(26,212)</td>
<td>1,537</td>
</tr>
<tr>
<td>Inventory</td>
<td>80,378</td>
<td>276,498</td>
</tr>
<tr>
<td>Accounts payable</td>
<td>(41,699)</td>
<td>133,932</td>
</tr>
<tr>
<td>Accrued expenses</td>
<td>(94,329)</td>
<td>152,697</td>
</tr>
<tr>
<td><strong>Net cash (used in) provided by operating activities</strong></td>
<td>(15,661)</td>
<td>772,229</td>
</tr>
<tr>
<td><strong>Cash flows from investing activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of investments</td>
<td>(581,837)</td>
<td>(885,078)</td>
</tr>
<tr>
<td>Proceeds from sale of investments</td>
<td>643,645</td>
<td>1,461,400</td>
</tr>
<tr>
<td>Purchases of property and equipment</td>
<td>(80,268)</td>
<td>(103,801)</td>
</tr>
<tr>
<td><strong>Net cash (used in) provided by investing activities</strong></td>
<td>(18,460)</td>
<td>472,521</td>
</tr>
<tr>
<td><strong>Cash flows from financing activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payments on capital leases</td>
<td>(433,126)</td>
<td>(454,437)</td>
</tr>
<tr>
<td>Payments on long-term debt</td>
<td>(938,172)</td>
<td>(258,354)</td>
</tr>
<tr>
<td>Net borrowing (payments) on line-of-credit</td>
<td>263,500</td>
<td>(9,099)</td>
</tr>
<tr>
<td><strong>Net cash used in financing activities</strong></td>
<td>(1,107,798)</td>
<td>(721,890)</td>
</tr>
<tr>
<td><strong>Net (decrease) increase in cash and cash equivalents</strong></td>
<td>(1,141,919)</td>
<td>522,860</td>
</tr>
<tr>
<td><strong>Cash and cash equivalents at beginning of year</strong></td>
<td>1,402,658</td>
<td>879,798</td>
</tr>
<tr>
<td><strong>Cash and cash equivalents at end of year</strong></td>
<td>$ 260,739</td>
<td>$ 1,402,658</td>
</tr>
</tbody>
</table>

Supplemental disclosure of cash flow information:

- Cash paid for interest was $64,657 and $71,683 for the years ended December 31, 2013 and 2012, respectively.
- Cash paid for income taxes was $0 and $23,160 for the years ended December 31, 2013 and 2012, respectively.

See notes to consolidated financial statements
NOTE 1
ORGANIZATION AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

ORGANIZATION
The Steadman Philippon Research Institute (“SPRI”), a non-profit organization, was incorporated in the state of Colorado on February 22, 1999, was founded in 1988, and is a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code (“IRC”). SPRI is located in Vail, Colorado, and is dedicated to keeping people of all ages physically active through orthopaedic research and education in the areas of arthritis, healing, rehabilitation, and injury prevention. SPRI’s primary sources of support are public donations, grants, special events, and corporate partners.

SPRI has agreements with several corporations that sponsor SPRI’s research. This research is for the general use of and publication by SPRI. These agreements are recorded as income in the year the research is performed and payment is received.

SPRI created the SPRI Leasing Corporation (“Subsidiary”), a wholly owned subsidiary, in order to hold the assets, liabilities, revenues, and expenses derived from SPRI’s MRI scanner.

PRINCIPLES OF CONSOLIDATION
The reporting entity referred to as Steadman Philippon Research Institute and Subsidiary (the “Institute”) includes the accounts of SPRI and SPRI Leasing Corporation. All intercompany accounts and transactions have been eliminated in consolidation.

BASIS OF PRESENTATION
The Institute reports information regarding its financial position and activities according to three classes of net assets: unrestricted net assets, temporarily restricted net assets, and permanently restricted net assets.

Unrestricted amounts are those currently available at the discretion of the Board of Directors (“Board”) for use in the Institute’s operations, fundraising, and certain programs.

Temporarily restricted amounts are monies restricted by donors specifically for certain purposes or programs; these monies are available for use by the Institute for the restricted purpose.

Permanently restricted amounts are assets that must be maintained permanently by the Institute as required by the donor, but the Institute is permitted to use or expend part or all of any income derived from those assets. As of December 31, 2013 and 2012, the Institute did not have any permanently restricted amounts.

CASH AND CASH EQUIVALENTS
The Institute considers all highly liquid investments with a maturity of three months or less when purchased to be cash equivalents, unless held for reinvestment as part of the investment portfolio or otherwise encumbered.

ACCOUNTS AND CONTRIBUTIONS RECEivable
Accounts and contributions receivable represent amounts due from individuals and organizations in support of the Institute’s programs. Management considers all amounts collectible; therefore, no allowance has been recorded as of December 31, 2013 and 2012.

Unconditional gifts expected to be collected within one year are reported at their net realizable value. Unconditional gifts expected to be collected in future years are reported at the present value of estimated future cash flows. The resulting discount is amortized using the level-yield method and is reported as contribution revenue.

INVESTMENTS
The Institute reports investments in equity securities with readily determinable fair values and all investments in debt securities at their fair values with unrealized gains and losses included in the consolidated statements of activities.

The Institute holds alternative investments, which are not readily marketable and are carried at fair value as provided by the investment managers. The Institute reviews and evaluates the value provided by the investment managers and agrees with the valuation methods and assumptions used in determining the fair value of the alternative investments. Those estimated fair values may differ significantly from the values that would have been used had a ready market for these securities existed.

Investment return includes dividend, interest, and other investment income; realized and unrealized gains and losses on investments carried at fair value; and realized gains and losses on other investments. Investment return is reflected in the consolidated statements of activities as unrestricted, temporarily restricted, or permanently restricted based upon the existence and nature of any donor or legally imposed restrictions.

INVENTORY
Inventory is stated at the lower of cost (first-in, first-out method) or market. Inventory consists of donated medical supplies of medical implants used for medical research.

PROPERTY AND EQUIPMENT
Land, buildings and improvements, and equipment purchased by the Institute are recorded at cost. Donated fixed assets are capitalized at fair value at the date of donation. Depreciation is provided on the straight-line method based upon the estimated useful lives of the assets, which range from three to seven years. Leasehold improvements are amortized over the shorter of the lease term plus renewal options or the estimated useful lives of the improvements.

OTHER INVESTMENTS
During 2009, the Institute received a contribution of real estate, which was recorded at estimated fair value at the date of donation. The investment is assessed for impairment if events and circumstances warrant such a review. No such impairment was recognized during 2013 or 2012.
DEFERRED RENT
Tenant improvement allowances paid by the landlord are recorded as deferred rent and are recognized as a reduction of rent expense over the term of the related lease.

CONTRIBUTIONS
Gifts of cash and other assets received without donor stipulations are reported as unrestricted support. Gifts received with a donor stipulation that limits their use are reported as temporarily or permanently restricted support. When a donor-stipulated time restriction ends or a purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the consolidated statements of activities as net assets released from restrictions.

Gifts of land, buildings, equipment, and other long-lived assets are reported as unrestricted support unless explicit donor stipulations specify how such assets must be used, in which case the gifts are reported as temporarily or permanently restricted support. Absent explicit donor stipulations for the time that long-lived assets must be held, expirations of restrictions resulting in reclassification of temporarily restricted net assets as unrestricted net assets are reported when the long-lived assets are placed in service.

REVENUE RECOGNITION
MRI and other income are recognized at the time the services are provided.

FUNCTIONAL EXPENSES
Expenses incurred directly for a program service are charged to such program. Allocations of certain overhead costs are also allocated to programs on a pro rata basis of total space occupied by each service or by headcount.

RESCINDED PLEDGE
During the year ended December 31, 2012, a donor notified the Institute that they were rescinding the remaining $600,000 of a pledge made in 2010. The Institute did not have any rescinded pledges during the year ended December 31, 2013.

INCOME TAXES
SPRI is exempt from federal income taxes under Section 501(c)(3) of the IRC. SPRI is not a private foundation within the meaning of Section 509(a) of the IRC.

SPRI Leasing Corporation is a for-profit corporation that is required to file a corporate income tax return for its operations and recognizes deferred tax assets and liabilities based upon differences between its basis of assets for tax and financial reporting purposes.

The Institute applies a more-likely-than-not measurement methodology to reflect the financial statement impact of uncertain tax positions taken or expected to be taken in a tax return. After evaluating the tax positions taken, none are considered to be uncertain; therefore, no amounts have been recognized as of December 31, 2013 and 2012. If incurred, interest and penalties associated with tax positions are recorded in the period assessed as general and administrative expense. No interest or penalties have been assessed as of December 31, 2013 or 2012. Tax years that remain subject to examination include 2010 through the current year for federal returns and 2009 through the current year for state returns.

USE OF ESTIMATES
The preparation of consolidated financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosures of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenue, expenses, gains, losses, and other changes in net assets during the reporting period. Actual results could differ from those estimates.

SUBSEQUENT EVENTS
The Institute has evaluated all subsequent events through the auditors’ report date, which is the date the consolidated financial statements were available for issuance.

NOTE 2
FAIR VALUE MEASUREMENTS AND INVESTMENTS

The Institute values its financial assets and liabilities based on the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. In order to increase consistency and comparability in fair value measurements, the following fair value hierarchy prioritizes observable inputs used to measure fair value into three broad levels, which are described below:

Level 1: Quoted prices in active markets for identical assets or liabilities that are accessible at the measurement date. The fair value hierarchy gives the highest priority to Level 1 inputs.

Level 2: Other than quoted prices that are observable for the asset or liability either directly or indirectly.

Level 3: Unobservable inputs where little or no market data is available, which requires the reporting entity to develop its own assumptions.

In determining fair value, the Institute utilizes valuation techniques that maximize the use of observable inputs and minimize the use of unobservable inputs to the extent possible, as well as considers counterparty credit risk in its assessment of fair value. These classifications (Levels 1, 2, and 3) are intended to reflect the observability of inputs used in the valuation of investments and are not necessarily an indication of risk or liquidity.

Following is a description of the valuation methodologies used for assets measured at fair value:

Common Stock and Mutual Funds: Valued at the closing price reported on the active market on which the individual securities are traded.

Limited Partnerships: Valued based on the net asset value per share of the fund.

There have been no changes to valuation methodologies during the years ended December 31, 2013 and 2012.

Financial assets carried at fair value as of December 31, 2013 are classified in the table below in one of the three categories described above.

<table>
<thead>
<tr>
<th>Description</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common stock</td>
<td>$15,981</td>
<td>-</td>
<td>-</td>
<td>$15,981</td>
</tr>
<tr>
<td>Equity mutual funds</td>
<td>785,304</td>
<td>-</td>
<td>-</td>
<td>785,304</td>
</tr>
<tr>
<td>Limited partnerships</td>
<td></td>
<td>3,749,666</td>
<td>-</td>
<td>3,749,666</td>
</tr>
<tr>
<td>Total</td>
<td>$801,285</td>
<td>3,749,666</td>
<td>-</td>
<td>$4,550,951</td>
</tr>
</tbody>
</table>

Financial assets carried at fair value as of December 31, 2012 are classified in the table below in one of the three categories described above.
Included in investments on the consolidated statements of financial position are money market funds in the amount of $624,622 and $423 at December 31, 2013 and 2012, respectively, which are not subject to fair value classification.

Investments in certain entities that calculate net asset value per share are as follows:

The Absolute Return Funds employ a strategy to achieve consistent positive, absolute returns with low volatility primarily by seeking to exploit pricing inefficiencies in equity and debt securities and by using a traditional hedge fund approach. The fair value of the investments has been calculated using the net asset value per share of the investments.

Investment return consists of the following:

For the years ended December 31,

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividends and interest - reinvested</td>
<td>$ 73</td>
<td>$ 6,364</td>
</tr>
<tr>
<td>Net realized and unrealized gains</td>
<td>615,165</td>
<td>485,795</td>
</tr>
<tr>
<td>Fees</td>
<td>(37,044)</td>
<td>(20,842)</td>
</tr>
<tr>
<td>Total return on investments</td>
<td>$ 578,194</td>
<td>$ 471,317</td>
</tr>
</tbody>
</table>

NOTE 5
LINE-OF-CREDIT

The Institute has an unsecured line-of-credit with a bank available up to $1,500,000, which bears interest at the prime rate plus 0.50% (3.75% at December 31, 2013) and matures in March 2018. As of December 31, 2013, the outstanding balance was $263,500. As of December 31, 2012, there was no outstanding balance.

NOTE 6
LONG-TERM DEBT

Long-term debt consists of the following:

<table>
<thead>
<tr>
<th>Description</th>
<th>December 31, 2013</th>
<th>December 31, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes payable to a bank paid in full during 2013.</td>
<td>-</td>
<td>938,172</td>
</tr>
<tr>
<td>Less current portion</td>
<td>-</td>
<td>(248,847)</td>
</tr>
<tr>
<td>Long-term portion of debt</td>
<td>$ -</td>
<td>$ 689,325</td>
</tr>
</tbody>
</table>

NOTE 7
CAPITAL LEASE

The Institute has acquired assets under the provisions of a capital lease. For financial reporting purposes, minimum lease payments relating to the assets have been capitalized. The lease expires in March 2014. Amortization of the leased property is included in depreciation expense.

The assets under capital lease have cost and accumulated amortization as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>December 31, 2013</th>
<th>December 31, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>$ 1,714,990</td>
<td>$ 2,188,507</td>
</tr>
<tr>
<td>Less accumulated amortization</td>
<td>(1,236,921)</td>
<td>(1,663,474)</td>
</tr>
<tr>
<td>Total</td>
<td>$ 478,069</td>
<td>$ 525,033</td>
</tr>
</tbody>
</table>

Maturities of capital lease obligations are as follows:

For the Year Ending December 31, 2014

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount representing interest</th>
<th>Present value of net minimum lease payments</th>
<th>Less current portion</th>
<th>Long-term capital lease obligation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(600)</td>
<td>100,790</td>
<td>(100,790)</td>
<td>$ -</td>
</tr>
</tbody>
</table>

NOTE 8
RETIREMENT PLAN

The Institute has a defined contribution retirement plan (the “Plan”) under IRC Section 401(k). Employees are eligible to participate in the Plan after one year of service. The Institute’s contributions to the Plan are determined annually. The Institute contributed $36,477 and $20,852 to the Plan in fiscal years 2013 and 2012, respectively.
NOTE 9
TEMPORARILY RESTRICTED NET ASSETS

The temporarily restricted net assets that have been restricted by the donors to be used only for specified purposes and/or are time restricted until payments on contributions receivable are received are as follows:

<table>
<thead>
<tr>
<th>Assets available for</th>
<th>December 31,</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>Education</td>
<td>$211,437</td>
</tr>
<tr>
<td>Assets available in future periods</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>74,213</td>
</tr>
<tr>
<td>Center for outcomes-based orthopaedic research</td>
<td>21,800</td>
</tr>
<tr>
<td>Imaging</td>
<td>-</td>
</tr>
<tr>
<td>Time restricted only</td>
<td>133,208</td>
</tr>
<tr>
<td>Total contributions receivable</td>
<td>$229,221</td>
</tr>
</tbody>
</table>

$440,658 $1,367,705

NOTE 10
RELATED PARTY TRANSACTIONS

During 2013 and 2012, the Institute received approximately $984,000 and $862,000, respectively, in contributions from related parties, including various Board members, employees, and medical staff at The Steadman Clinic (the “Clinic”).

In addition, the Institute received $962,514 from the Clinic during both 2013 and 2012, as a corporate sponsor and for the use of certain equipment.

The Institute owed a Board member $30,000 for contracted management services, which is included in accounts payable as of December 31, 2013.

NOTE 11
INCOME TAXES

Income tax (benefit) expense has been computed at the statutory rates applicable during the period. The components of taxes on income are approximately as follows:

<table>
<thead>
<tr>
<th>For the Years Ended December 31,</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
</tr>
<tr>
<td>Current</td>
</tr>
<tr>
<td>Federal</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>(98,000)</td>
</tr>
<tr>
<td>Deferred</td>
</tr>
<tr>
<td>Federal</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>(21,000)</td>
</tr>
<tr>
<td>$119,000</td>
</tr>
</tbody>
</table>

The Institute’s deferred tax assets and liabilities are a result of the difference in the tax and book basis of depreciable assets.

NOTE 12
COMMITSMENTS

OPERATING LEASES

The Institute leases facilities under non-cancelable operating leases expiring between January 2014 and February 2016, which call for both base rent payments and operating expenses. Rent under these leases for the years ended December 31, 2013 and 2012 was $316,502 and $316,486, respectively.

Future minimum lease payments under these leases are approximately as follows:

<table>
<thead>
<tr>
<th>Year Ending December 31,</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
</tr>
<tr>
<td>2015</td>
</tr>
<tr>
<td>2016</td>
</tr>
</tbody>
</table>
| $264,000

