

Steadman•Hawkins

SPORTS MEDICINE FOUNDATION VOLUME 6 FALL/WINTER 1999

An International Center for Research and Education — Keeping People Active

PATIENTS IN THE NEWS:

Mirte and Marnie: Dedicated Skiers, A Generation Apart

Editor's Note: The following profiles are based on interviews by Dick Needham. Mr. Needham is Editor of the Skier newsletter "Inside Tracks" and Senior-Contributing Editor of "Ski" Magazine.

Over the years, Steadman-Hawkins has treated a number of athletes' pro football players, soccer stars, bicycle racers, pro golfers and ski racers. Names like Elway, Street, Norman, and Girardelli have, to be sure, earned the Steadman-Hawkins Clinic an indelible cache in the sports world — sort of like Disney's care and feeding of Mickey, Minnie, Goofy and Donald.

But what of the not-so-well-known patients, those unsung amateur and recreational athletes — of all disciplines and ages — who have suffered debilitating injuries and now participate in their sport at levels they never before believed possible?

Two women, of vastly different ages but of no less talent, determination and dedication, have their own stories to tell. And what they have to say about their experience at Steadman-Hawkins should serve as inspiration not only to other amateur and recreational athletes, but to us all.

Mirte Mallory, 19, was a shining star in the Nordic world until her knee met a rock during a kayaking mishap last summer. A combination of poor body mechanics, muscle imbalances and impact forced her to lay up her skis this past season and become a full-time rehabber. The Aspen resident and Dartmouth student, considered one of America's top cross-country skiing prospects (she was named to the US National Junior Elite Team), went to Steadman-Hawkins' Dr. William Sterett after pain in her knee failed to subside after trying all non-invasive forms of rehab and a ski season had passed without skiing.

Dr. Sterett performed a patella (kneecap) tendon fenestration, in which the patella tendon was cut and punctured with holes so that the blood could flow to the tendon to revitalize it.

(Continued on page 9)

SPORTS AND WELLNESS:

Weight-Bearing Exercise For A Healthier Body

By J. Richard Steadman, M.D., Gene "Topper" Hagerman, Ph.D., John Atkins, M.S., A.T.C., Michael Torry, Ph.D., Michael Decker, M.S., and the staff of the Steadman•Hawkins Sports Medicine Foundation.

Editor's Note: The following is an adaptation of an article that appeared in the June 14, 1999 issue of "Newsweek" and is reprinted by permission.

For a number of years, the medical drums have been sounding the alarm about loss of bone density in women, lack of muscle tone in men and vitamin deficiencies in all of us, leading to a range of disease, osteoporosis, lower-back syndrome, obesity and orthopaedic problems of all kinds. Based on our research, there is both a common cause and a definable cure.

As a nation, we have become more sedentary. Though there's a lot of talk at cocktail parties about going

(Continued on page 10)

VIRTUAL-KNEE PROJECT PROVIDES GLIMPSE INTO THE FUTURE

By Van C. Mow, Ph.D.

Editor's Note: In February 1994, Dr. Van C. Mow began a collaborative research effort with Dr. J. Richard Steadman of the Steadman•Hawkins Sports Medicine Foundation that encompassed a variety of important areas in orthopaedic surgery and sports medicine. Dr. Mow is the Stanley Dicker Professor of Biomedical Engineering and Orthopaedic Bioengineering, and Chairman of the Department of Biomedical Engineering at Columbia University in New York City.

In the not-so-distant future, orthopaedic surgeons will have a powerful new computer-aided tool at their disposal that will greatly enhance and expand their diagnostic and surgical skills. Thanks to active collaboration between Dr. J. Richard Steadman and Dr. Van C. Mow, computer modeling at the doctor's office will become as common a diagnostic aid as the X-ray machine.

(Continued on page 11)



PHOTO COURTESY OF JOHN KELLY.

IN THIS ISSUE

Biomechanics Research Team Wins International Award

Visit Your Virtual Knee

Microfracture and Healing Response Outcomes Promising

CADS Reduces Pain and Fatigue in Skiers

DR. CHARLES DILLMAN NAMED ACTING FOUNDATION CEO

Dr. Charles Dillman, Group Vice President for Research and Development of Orthofix, N.V. and a former CEO of the Steadman♦Hawkins Sports Medicine Foundation, is returning as acting president and CEO of the Foundation, following the resignation of George Mongon. After three successful years as the head of the Foundation, Mr. Mongon is leaving to pursue other busi-

ness interests. During Mongon's tenure, the Foundation doubled its income and increased individual giving by 25 percent.

Although Dr. Dillman returns as Foundation CEO, he will continue in his present position with Orthofix. Says Dr. Richard Steadman, a Foundation founder and its board chairman, "Chuck Dillman is the perfect individual to guide the Foundation at this important time. He knows the staff and its mission, and he is committed to the scientific mandate of the Foundation's research. His experience with Olympic athletes, with the International Olympic Committee, and his scientific credentials in the areas of our research make him the right man for the job. We are delighted that he's accepted our invitation to return."

Dr. Dillman received his Ph.D. in Exercise Science and Biomechanics from Pennsylvania State University. In addition to his current positions at the Foundation and at Orthofix, Dr. Dillman is also a member of the Medical Commission of the International Olympic Committee (IOC). In that capacity, he acts as program director of the IOC World Congress on Sport Sciences, is co-director of research projects at the Olympic Games, and is co-chair and founding member of the IOC Olympic Academy of Science.

Dr. Dillman began his career in academia. He was an assistant professor at The Citadel, at the University of Delaware, and at the University of Illinois. He spent seven years with the U.S. Olympic Committee as head of bio-mechanics and then as director of sports science. He has published more than 70 papers and completed more than 250 presentations around the world. He was named a permanent "Alumni Fellow" by Pennsylvania State University for his outstanding achievements in the field of sports science. He is a member of the American Society of



*Foundation CEO
Charles J. Dillman, Ph.D.*

Shoulder and Elbow Surgeons and, for his research on throwing injuries, has received the James R. Andrews Award for Excellence in Sports Medicine Research. He was also recently elected a "Fellow" at the American Institute for Medical and Biological Engineering. In February 1998, Dr. Dillman was awarded the prestigious "Olympic Order" by the IOC for outstanding contributions to the worldwide Olympic movement.

Dr. Dillman will divide his time between the Foundation and Orthofix, which is based in Charlotte, N.C. ■

INTERNATIONAL SOCIETY OF BIOMECHANICS PRAISES FOUNDATION'S KNEE RESEARCH

Dr. Michael Torry Wins International Biomechanics Award; Michael Decker Is Calgary Biomechanics Award Finalist

Dr. Michael Torry, director of lower extremity research in the Human Performance and Rehabilitation Department at the Steadman♦Hawkins Sports Medicine Foundation, has won the prestigious International Society of Biomechanics Clinical Biomechanics Award, given once every two years for outstanding research in the field of biomechanics and human performance. Dr. Torry's award-winning paper, "Intra-Articular Knee Joint Effusion Induces Quadriceps Avoidance Gait Patterns," was one of five finalists selected in a worldwide competition that included much of the best clinical research conducted in 1999. The authors of the paper were Michael Torry, Ph.D., Michael Decker, M.S., Randy Viola, M.D., Dennis O'Connor, M.S., and J. Richard Steadman, M.D. His selection as the award recipient was announced at the 27th International Society of Biomechanics Congress in Calgary, Alberta, in August.

A second paper, "The Immediate Effects of Enforcing the Resonant Frequency of a Modified Force Driven Harmonic Oscillator Model on the Gait Patterns of ACL Reconstructed Individuals," was nominated as one of three finalists for the Calgary Biomechanics Award in the category of orthopaedics. The paper, which analyzes the gait patterns of ACL-reconstructed patients with the goal of developing gait retraining protocols that will allow patients to resume normal walking patterns earlier in rehabilitation, was selected from 60 submitted abstracts. The authors of this paper were Michael Decker, M.S., Michael Torry, Ph.D., Tom Noonan, M.D., Dennis O'Connor, M.S., and J. Richard Steadman, M.D.

According to Dr. Steadman, Chairman of the Board of the Steadman♦Hawkins Sports Medicine Foundation, the Award is evidence of the important research being done in Vail. "Our mission," said Dr. Steadman, "is to keep people active by investigating ways to avoid injuries to our joints, researching ways to repair and rehabilitate injuries when they occur and, underlying all our work, to try to uncover the mysteries of what causes osteoarthritis and other joint-deteriorating diseases."

"Dr. Torry's work focused on the effects on muscles surrounding the knee joint and the changes to a person's stride caused by anterior cruciate ligament deficiency, a relatively common problem in athletes. The results of his research add to our knowledge of ACL-deficient injuries and to our ability to treat such patients by designing optimally effective rehabilitation programs. We are very proud of Dr. Torry and Mr. Decker and we congratulate them both on this important recognition." ■

PARTNERS IN PROGRESS:

SCHWINN AND NIPPON SIGMAX PARTNER WITH FOUNDATION Nippon Sigmoid To Send Visiting Physicians

Nippon Sigmoid Co., Ltd., a leading, worldwide manufacturer and distributor of orthopaedic and sports medicine products, is the Steadman◆Hawkins Sports Medicine Foundation's newest corporate partner. With its donation of \$50,000, Nippon Sigmoid will have the opportunity to send visiting physicians to the Foundation's research and clinical facilities in Vail for orthopaedic training. There will also be an opportunity to work with the Foundation's clinical and human performance research staff in projects of interest to the company.

Nippon Sigmoid, based in Tokyo, has subsidiaries in Korea, Seoul and California.

Foundation And Topper Sportsmedicine To Assist Schwinn's Fitness Division In Product Development And Fitness Research

Schwinn's Fitness Division, a worldwide manufacturer of commercial and home exercise equipment, has signed a corporate partnership with the Steadman◆Hawkins Sports Medicine Foundation and Topper Sportsmedicine to develop new exercise products and investigate better ways to exercise for people of all ages. The agreement provides Schwinn access to the facilities and staff of both the Steadman◆Hawkins Sports Medicine Foundation and Topper Sportsmedicine, both located in Vail, Colo.

Topper Sportsmedicine is a leader in products and methods for rehabilitation, injury prevention and sports performance enhancement. Topper Hagerman and John Atkins, principals of Topper Sportsmedicine, have been an integral part of the Steadman-Hawkins team, having worked with both the Clinic and Foundation for several years.

Says Kevin Lamar, vice president at Schwinn Fitness, "The goal at Schwinn Fitness is to provide the best exercise options to the consumer — to make a higher level of fitness for a healthier, longer life a reachable goal for everyone. This partnership will allow us to work on sponsored research at Steadman-Hawkins' rehabilitation and human performance lab, engage in product testing and development with the principals of Topper Sportsmedicine, and involve ourselves as a participant in that work on their respective websites. Given the great reputation and important work both the Steadman◆Hawkins Sports Medicine Foundation and Topper Sportsmedicine have already done in our areas of interest, we have high hopes for this new relationship." ■

Arthritis Foundation Honors Steadman-Hawkins Science Advisor Dr. Rodrigo — Receives Humanitarian Award



Juan J. Rodrigo, M.D.

Dr. Juan J. Rodrigo, professor of orthopaedics at the University of California/Davis and Foundation science advisor, was honored by the California Chapter of the Arthritis Foundation as Humanitarian 1998 for the many contributions he has made to his profession and community. Despite his dedication to patients and students alike, he still finds time for community projects and service.

Dr. Rodrigo has been a mentor for the U.C. Davis Upward Bound program, Vice Chairman for the Arthritis Foundation Humanitarian Awards Banquet, and a driver in the Arthritis Foundation's Mini Grand Prix auto race. Currently, as a member of the Steadman◆Hawkins Sports Medicine Foundation's Scientific Advisory Committee, he reviews proposals and designs for research projects, and assists in the charting of research directions at the Foundation.

According to an Arthritis Foundation spokesman, "Dr. Rodrigo imparts the wisdom of his vast experience to future doctors as a professor. What more can be said than a job well done. Dr. Rodrigo is a tribute to his profession and his community — outstanding in every way." ■

STEADMAN HAWKINS RESEARCH UPDATE: Healing Response Long-Term Outcomes Show Promise

By Karen Briggs, M.B.A., director of Clinical Research

ACL injuries continue to present a difficult problem for orthopaedic surgeons. It is difficult to predict whether such injuries will cause severe disability or only minimal impairment. Consequently, Dr. Steadman has developed a procedure that is called the "Healing Response" as an alternative to formal reconstruction or to no intervention. This procedure is designed especially for proximal one-third (near the thigh-bone) ACL injuries, the type frequently suffered by skiers. It is minimally invasive and uses the microfracture awl arthroscopically to produce a "super clot" from microfracture holes located at the femoral origin of the ACL. There is no fixation or immobilization, and we rely completely on the surgically induced super clot,

which emerges from the bone marrow to capture the torn ACL. We believe the Healing Response procedure has significant advantages that outweigh its potential disadvantages. Most importantly, it is a technically simple procedure for the surgeon to perform with little downside risk.

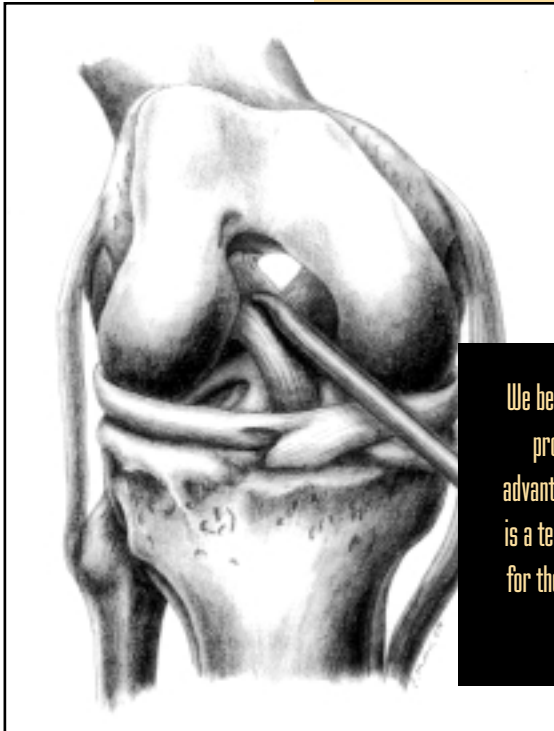
As of December 1998, more than 800 patients had undergone the Healing Response procedure. Of these, 518 patients are at least two years out following surgery. Seventy percent of the patients were injured while skiing. Average age of these patients was 40 with 10 years being the youngest and 70 years being the oldest. The Clinical Research Department reports that more than 90 percent of these patients feel their knee functions are normal to nearly normal. Most patients reported no giving way following surgery. On a scale of 1-10 with 10 being most active, patients reported increasing their sports activity level from 3.1 prior to surgery, to 7.0 post-operatively. A similar improvement was also seen in patient activity of daily living, which improved from 5.1 to 9.0 following surgery.

A significant improvement was also seen in the patients' KT-1000 manual max difference (MMD) tests, a measurement of knee joint laxity, with higher numbers indicating increased joint laxity. A recent study was completed with 112 Healing Response patients in which a pre-operative and post-operative KT-1000 MMD test was performed. Patients had a KT-1000 MMD of 3 mm or more and were divided into three groups. Group A consisted of patients with a pre-operative KT-1000 MMD range equal to 3 mm but less than 5 mm difference (39); group B consisted of patients with a pre-operative range equal to 5 mm but less than 7 mm (36); group C included patients with a range greater than 7 mm (37). Pre-operatively, group A had an average KT-1000 manual maximum difference of 3.5 mm, group B had an average MMD of 5.5 mm, and group C had an average MMD of 8.3 mm. There was dramatic improvement following surgery. Post-operatively, group A averaged 2.6 mm difference, group B averaged 2.5 mm difference and group C averaged 3.1 mm difference. There was no significance difference between the three groups post-operatively.

Ninety-five percent of patients in group A reported post-operative knee function to be normal to nearly normal and, in

groups B and C, 97 percent reported post-operative knee function to be normal to nearly normal. In groups A and B, 97 percent of the patients reported no giving way and, in group C, 94 percent reported no giving way. On a scale of 1-10 (with 10 being very satisfied), patient satisfaction in group A was 9.2, group B was 9.2, and group C was 8.9. Similar results have been seen in all Healing Response patients regardless of the pre-operative KT-1000 MMD value, with patients reporting similar improvement and return-to-normal knee function.

More data will be collected in 1999. A study will also be completed that will determine if KT-1000 measurements change over time following the ACL Healing Response. We will also be following athletes who have not yet reached maturity and who have undergone the Healing Response procedure to determine if it is an effective alternative for patients with ACL injuries who have open growth plates. ■



Healing response: microfracture awl producing holes in subchondral bone at the femoral origin of the ACL.

ILLUSTRATION
COURTESY OF
ELIZABETH
MURDOCK.

We believe the Healing Response procedure has significant advantages. Most importantly, it is a technically simple procedure for the surgeon to perform with little downside risk.

MICROFRACTURE UPDATE: Study to Focus on NFL Athletes and High Tibial Osteotomy

In 1998, a paper published in *Orthopaedics* compared the results of Microfracture in both the elite and recreational athlete during an average follow-up of 3.7 years. The study showed significant improvement for both the elite and recreational athlete in function as well as in symptoms.

This study is now being expanded to examine the outcomes of Microfracture in more than 35 professional football players, with the goal of determining how long it takes a player to return to his previous level. In 1999, we will complete a study with Dr. William Sterett on patients who have received a high tibial osteotomy with Microfracture. In these patients, Dr. Sterett has re-aligned the knee joint surface surgically and stimulated cartilage regeneration with Microfracture. Preliminary data show these patients have had excellent outcomes to date. ■

CADS System Reduces Skiing Pain And Fatigue Foundation Study Provides Scientific Proof

Editor's Note: Former Steadman-Hawkins Fellow Dr. John Wright conducted an analysis of CADS at the Steadman-Hawkins Sports Medicine Foundation to provide a biomechanical explanation as to why skiers who use CADS experience less quadriceps fatigue and less knee pain. After completing his Fellowship with Drs. Steadman and Hawkins in July 1999, Dr. Wright joined the Steadman-Hawkins Clinic in Vail and Breckenridge to specialize in hip and knee replacement.

If you or a friend has given up skiing, or you're thinking about giving up skiing because of knee pain and fatigue, you should know about CADS.

"Constant-force Articulated Dynamic struts" (CADS) were conceived by engineer/inventor Walter Dandy to alleviate quadriceps muscle fatigue and knee pain in skiers. The paired devices consist of fiberglass

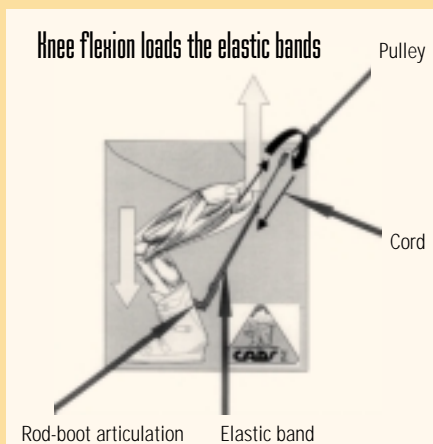
rods and cords which run between a pelvic harness and thick elastic bands which are anchored to the ski boots. This suspension system transfers weight from the legs to the rods.

For several years, Steadman-Hawkins patients who have used CADS have claimed the system reduces pain and fatigue. Many patients suffering from arthritis and/or patello femoral pain report that CADS allow them to ski with significantly less knee discomfort.

A static free body analysis was performed to quantify knee joint forces during flexed-knee stance. The unloading effect of the CADS at various degrees of knee flexion was calculated by having subjects sit upon a CADS simulation apparatus.

Ordinarily, when a skier bends his or her knees, the quadriceps muscles must contract to prevent the skier from falling over. This is why wall-sits cause a burning sensation in the quadriceps. The heavier the skier, the greater the quadriceps must work to maintain a flexed-knee stance. Furthermore, the deeper a skier flexes his or her knees, the more the quadriceps muscles must contract. Stronger quadriceps contraction in turn produces increased compressive forces across the knee joint.

When a skier wearing CADS bends the knees to assume a skiing position, the elastic bands of the CADS are stretched. The stretch in the elastic bands is transmitted via the cords over the pulleys to the pelvic harness. This reduces the skier's effective body weight and, hence, diminishes the required quad-contraction strength. Decreased quadriceps contraction, in turn, reduces compressive forces across the surfaces of the knee joint. The study documented that, at 50 degrees of knee flexion, CADS reduced effective body weight, quad contraction force, and joint contact force by 22 percent. CADS-induced reductions in these forces are even greater at higher degrees of knee flexion.



At 50 degrees of knee flexion, CADS reduces effective body weight, quad contraction force, and joint contact force by 22 percent.

STEADMAN HAWKINS UPDATE: Publications, Presentations And Research

Dr. J. Richard Steadman is working on a new book to be published by Lippincott, Williams & Wilkins, *Management and Rehabilitation of the Knee: The Steadman Technique*. Editors are Dr. Steadman, former Steadman-Hawkins Fellow Kevin Plancher, M.D., and Foundation Basic Science Director William Rodkey, D.V.M. Clinical Research Director **Karen Briggs, M.B.A.** will author two chapters on patient outcomes. The book is certain to become the Bible for clinical and surgical care of knees and will be released in late 2000.

Dr. William Rodkey reports that the first Basic Science refereed paper on Microfracture, "Arthroscopic Subchondral Bone Plate Microfracture Technique Augments Healing of Large Chondral Defects in the Radial Carpal Bone and Medial Condyle of Horses," was recently published in *Veterinary Surgery*. The paper reports on the continuing research of microfracture at the Equine Orthopaedic Research Laboratory College of Veterinary Medicine and Biomedical Sciences at Colorado State University. The study concludes that treatment with subchondral bone microfracture increased the tissue volume in the defects and the percentage of type II collagen (an important building block found in normal mature articular cartilage). "No negative effects of the microfracture technique were observed and some of the beneficial effects are the basis for recommending its use in patient cases with exposed subchondral bone." A second paper on microfracture was published this year in the German publication, *Orthopaede*. The paper describes the surgical procedure and the conditions under which it should be considered.

In the Rehabilitation and Human Performance Laboratory, Lower Extremity Director **Mike Torry, Ph.D.** received word that the paper "Internal and External Tibial Rotational Strength after ACL Reconstruction Using Ipsilateral Semitendinosus and Gracilis Autographs" has been accepted for publication in the *American Journal of Sports Medicine*. The authors are Randy Viola, M.D., Michael Torry, Ph.D., William I. Sterett, M.D., and J. Richard Steadman, M.D.

Upper Extremity Director **Sherry Werner, Ph.D.**, announced that a poster presentation has been accepted for the AAOS meeting: "Injury Prevention in the Throwing Athlete: A Biomechanical Study."



Karen Briggs, M.B.A., director of Clinical Research.
PHOTO COURTESY OF JOHN KELLY.

In July, Upper Extremity Biomechanist **Tricia Murray** traveled to Sydney, Australia to present the paper "Biomechanical Changes in Professional Baseball Pitchers: Early vs. Late Innings," during the annual meeting of the International Society for Biomechanics and Sports. She also moderated a session on "Theoretical and Applied Sport Biomechanics."

The **National Football League's New York Giants** and **Carolina Panthers** have invited Dr. Werner's Upper Extremity Research Group to present a motion analysis study of their quarterbacks. The purpose of the research will be to add to the upper-extremity data-base on injury and performance factors in elite-level athletes.

Golfer **Greg Norman** has asked the Upper Extremity Research team to film and analyze 24 top professional golfers at his annual Shark Shootout in November. Dr. Werner has also been invited by the U.S. Luge Association to study their athletes in Lake Placid in September. The focus of her work will be to analyze muscle activity during the start.

A W A R D S

In addition to winning the prestigious International Society of Biomechanics Clinical Biomechanics Award (see Biomechanics Award, page 2), Mike Torry, Ph.D. was honored October 2 at his Alma Mater, Illinois State University, by winning the **Distinguished Alumni Award**. He was recognized for "outstanding contributions to his field of study." Previous recipients include basketball player Doug Collins, who played for the NBA Philadelphia 76ers and coached the Chicago Bulls.

At the American Orthopaedic Society for Sports Medicine annual meeting in June, the Clinical Research Department won the **Aircast Clinical Investigational Award** for the paper by former Steadman-Hawkins Fellow Scott D. Mair, M.D., "Acute PCL Injuries and Bone Bruising."

Media

On May 15, CBS' *Good Morning America* reported on the collaborative effort between the Foundation and Colorado State University in cartilage research. The Spring Health and Fitness insert in the June 14 *Newsweek* carried the Foundation article "Weight-Bearing Exercise for a Healthier Body" by J. Richard Steadman, M.D., Gene "Topper" Hagerman, Ph.D., and John Atkins, M.S., A.T.C. CBS Television's weekly news magazine *48 hours* rebroadcast a segment this summer on Olympic Gold Medalist Picabo Street's on-hill skiing accident with coverage of her surgical repair by physician and friend Dr. J. Richard Steadman. The segment also included an update on her rehabilitation. Denver radio station KEZW 1430's *Golftalk* hosted the Foundation's Golf Research Team in a lively one-hour discussion about the Foundation's golf research with Board member **Greg Norman**. The panelists included Dr. Richard J. Hawkins, Foundation CEO Chuck Dillman, Ph.D., and Sherry Werner, Ph.D. Look for the Rocky Mountain Chapter of the *Arthritis Foundation's* publication *Get Up and Go* and Website to publish "Walking with Poles," authored by **Mike Torry, Ph.D.**, and **Mike Decker, M.S.**

Incredible Journey

John Feagin, M.D., a member of the Foundation's Scientific Advisory Committee and Associate Professor of Orthopaedics at Duke University, recently traveled to Europe. On July 6, he piloted his single engine Cessna "The Spirit," from his airport in Chapel Hill, N.C., over the North Atlantic to Europe. His itinerary, including overnight stops, took him from North Carolina to Bangor, Maine, where the back seats of his plane were taken out and the plane was fitted with gas tanks. From Bangor, he flew to Goose Bay, Labrador, then seven hours over the open Atlantic to Narsarsuaq, Greenland, followed by six hours to Reykjavik, Iceland. From Iceland he flew five hours to Scotland and arrived in London on July 16 and Munich on July 23. Once on the Continent, he visited colleagues and then flew commercially to Kenya, Africa where he donated a month of his time to the 350-bed Tenwek Hospital, 150 miles west of Nairobi. "The Spirit" is back in Oxford, England waiting for Dr. Feagin to bring her home. For more on Dr. Feagin's adventure, visit his web site at: www.mindspring.com/~berend/feagin.htm ■

EDUCATION: New Fellows Are Named

The Steadman-Hawkins Clinic and Sports Medicine Foundation have selected six new Fellows from a pool of 160 applicants to spend this coming year learning new surgical techniques from Drs. Steadman, Hawkins and Sterett. Steadman-Hawkins Fellows will also participate in research with Foundation scientists in the areas of Clinical Research, Basic Science, and Rehabilitation/Human Performance. Regarded as one of the most prominent Fellowship programs in orthopaedic sports medicine, more than 100 Steadman-Hawkins Fellows are now practicing medicine world-wide.

James T. Johnson, M.D.

Dr. Johnson began his academic career at the University of California at Los Angeles, followed by studies at the George Washington School of Medicine and residency at the Yale School of Medicine. Dr. Johnson's interest in research is evidenced by the fact that he has been published in *Clinical Orthopaedics and Related Research* and has had abstracts accepted by the journals *American Academy of Orthopaedic Surgeons* and *Orthopaedic Research*. He has been involved in community affairs as a Volunteer Community Organizer for Camp Ronald McDonald, he has coached Little League baseball, and has served as a volunteer for the Special Olympics.

Spero G. Karas, M.D.

Dr. Karas completed his residency at Duke Medical Center. Prior to his residency, Dr. Karas received his undergraduate degree in psychology and pre-medicine from the University of Notre Dame and attended medical school at the Indiana University School of Medicine. As an undergraduate student-athlete, he was a member of the varsity wrestling team, where he became an NCAA Catholic College All-American. During his residency, he was head resident team physician for Duke University and North Carolina Central University. Dr. Karas has worked under Dr. William Garrett in the Nike Performance Lab at Duke, studying the nature of injuries and injury prevention.

Mininder S. Kocher, M.D.

Dr. Kocher graduated from Dartmouth College in Biology and Psychology and attended medical school at Duke University. He completed his residency at the Harvard Combined Orthopaedic Residency Program. He held Fellowship positions in Pediatric Orthopaedics at Children's Hospital, at the Harvard School of Public Health, and in Orthopaedic Biomechanics at the Musculoskeletal Research Laboratories at University of Pittsburgh. A Phi Beta Kappa, Magna Cum Laude (Dartmouth), and former National Merit Scholarship recipient, Dr. Kocher has been published in such peer-review journals as *The American Journal of Sports Medicine*, *The Journal of Bone Joint*

P H O T O

Left to right, back row: J. Richard Steadman, M.D., James T. Johnson, M.D., William I. Sterett, M.D., Mininder S. Kocher, M.D., Spero G. Karas, M.D., and Dr. Richard J. Hawkins, M.D. *Left to right, front row:* Erol A. Yoldas, M.D., Michael P. Zafuta, M.D., and John D. Michelotti, M.D.

Surgery, The Journal of Shoulder and Elbow Surgery, and The Journal of the American Academy of Orthopaedic Surgeons, among others.

John D. Michelotti, M.D.

A Montana native, Dr. Michelotti spent his academic career in the Pacific Northwest. Following his undergraduate education at Carroll College in Montana, Dr. Michelotti attended The University of Washington for medical school and residency. His academic achievements include the Bishop Gilmore Trophy for outstanding senior scholar at Carroll College and the Merck Manual Award for outstanding academic achievement at the University of Washington Medical School. A Frontier Conference All-American Wide Receiver for two years and an Academic All-American, Dr. Michelotti has devoted much of his time to athletics and orthopaedics. His research background has focused on the shoulder, hip and spine, with presentations at the American Academy of Orthopaedic Surgeons and the American Society of Elbow Surgeons.

Erol A. Yoldas, M.D.

The University of Pittsburgh has produced many fine orthopaedic surgeons, and Dr. Yoldas is certainly no exception. Prior to his residency at Pitt, Dr. Yoldas attended Duke University for his undergraduate degree in Biomedical Engineering and Yale University for Medical School. His honors include membership in the Alpha Omega Alpha Honor Society, Tau Beta Pi Engineering Honor Society and graduating cum laude with distinction from Duke. Truly international, Dr. Yoldas also speaks Ukrainian, Russian, Turkish and Spanish, a talent which will come in handy with our patients from abroad.

Michael P. Zafuta

Dr. Zafuta completed his residency at the University of Texas-Southwestern. He earned his Bachelor of Science degree in biology and graduated magna cum laude from Pittsburg State University in Kansas. An honors graduate from the Baylor College of Medicine, Dr. Zafuta is a member of the Phi Kappa Phi Honor Society, Beta Beta Beta Honor Society, Lambda Sigma Honor Society and is a Presidential scholar. He was also elected to the Alpha Honor Society as a junior medical student. His academic achievements are exceeded only by his sense of humor, as shown in his fellowship application: "My father is not an orthopaedic surgeon. In fact, he's not even a doctor. I've never had my knees or shoulders scoped. Both of my ACLs are intact. Despite these shortcomings, I am extremely interested in fellowship training in sports medicine/arthroscopy." ■

Fred and Elli Iselin Foundation Establishes Fellowship Chair

The Fred and Elli Iselin Foundation of Aspen, Colo., has established a fellowship chair for medical research. The chair, funded for the year, will be filled by an orthopaedic surgeon who will train in the areas of advanced rehabilitation and human performance.

The Fred and Elli Iselin Foundation is dedicated to the advancement and enrichment of the quality of life for individuals and families. The Iselin Foundation is concerned primarily with medical research and sciences, education, youth services, environmental protection, national and international sports competitions, and the prevention of cruelty to children and animals. The founders were both active sports participants and played a major role in establishing skiing as a high profile sport and Aspen as one of its worldwide centers.

According to Iselin Foundation President James Daggs, the Iselins wanted their Foundation to support medical work that keeps people active. Fred Iselin was a Swiss-born skier, racer and co-founder of the Aspen Ski School. Elli Iselin was an Austrian-born skier, former member of the Austrian national ski team and Austrian Olympic rowing team, a mountaineer and ski instructor, and Aspen retailer. Together they represented skiing to the world from their home in Aspen. "Theirs was a life filled with the joys of outdoor sport," says Daggs. "They would be delighted to know that their support of the Steadman♦Hawkins Sports Medicine Foundation's Fellowship Program would help a young doctor learn more about keeping skiers on the hill longer and, perhaps some day, discover a way to prevent the kind of traumatic sports injury that took Fred's life in 1971. Knowledge is the most powerful weapon on earth. The Iselin Foundation is dedicated to the acquisition and use of knowledge for the betterment of man."

The task of the Iselin Fellow is to develop new treatment protocols for osteoarthritis and research new techniques for prevention, cures and rehabilitation. ■

MEET OUR STAFF: Patricia Herrington Raises Funds — And Fun!

In order for the Foundation's important research to continue, we need dedicated researchers, patients willing to share their outcomes, and journals in order that



Your financial support helps us to meet our goal: to examine how individuals become injured, to develop methods and procedures which improve the healing process, to create educational materials and programs to reduce injury and to help medical personnel treat individuals more effectively.

we might publish our results. There is another, just as essential factor to this equation: a development staff that can work to raise the necessary funds.

Patricia Herrington is our consulting director of development at the Steadman♦Hawkins Sports Medicine Foundation. Along with John McMurtry and Rachel Lenz, Patricia designs and implements the coordination and execution of all our special events, as well as our direct mail campaigns. The Foundation has been fortunate to have Patricia's vast experience and enthusiasm on board. Her creative and energetic personality has enabled the Foundation's annual budget to grow over the past four years from \$1.5 million to \$2.7 million.

Patricia came to the Foundation from Bravo! Colorado Vail Valley Music Festival where she served for eight years as Vice Chair, Chairperson of the Board and, finally, Director of Development. Her fundraising experience is exceeded only by her effectiveness and tireless enthusiasm. Some say it's her red hair, but we know better. ■

FIVE YEAR PLEDGE TO SUPPORT REHABILITATION RESEARCH

Steve and Mary Read Fellowship Chair

Mr. and Mrs. Steven Read have pledged \$125,000 over the next five years to fund the Steve and Mary Read Fellowship Chair. The Chair will be dedicated to the research of rehabilitation with emphasis on developing protocols for lower-extremity rehabilitation of patients with osteoarthritis. The Fellowship will be actively involved in Clinical Research, Basic Science and the Rehabilitation/ Human Performance research of degenerative joint disease.

Both Mary and Steve have first-hand knowledge of the importance of rehabilitation following surgery. Their desire is to keep their active lifestyles as avid skiers and golfers. Steve is Chief Executive Officer of Grocery Outlets, a 116-store chain of supermarkets in the seven western states and Hawaii, headquartered in Berkeley, Calif. The Reads are also involved in many other philanthropic causes, with Steve serving as trustee of the San Francisco Fine Arts Museum, Head-Royce School in Oakland, Trinity College-Duke University, and as a Board member of the San Francisco Opera. The funding of this chair ensures that graduating Fellows of the Steadman♦Hawkins Sports Medicine Foundation will be trained to offer their patients and colleagues the latest information and techniques in treating and caring for osteoarthritis.

Presently, 20.7 million people in the United States suffer from osteoarthritis — a debilitating degenerative joint disease in which cartilage covering the ends of bones deteriorates. It is the most common form of arthritis by far. ■

Director of Development Patricia Herrington.

PHOTO COURTESY OF GEORGE PEIRCE.

(MIRTE AND MARNIE from pg. 1)

Dr. Sterett also removed scar tissue and plica around the kneecap (plica is a substance that often forms in athletes who exercise heavily), which helped to realign the kneecap. Since her operation in March, Mirte's left knee has gradually improved, encouraging her to bring her right knee up to speed by having Dr. Sterett remove the scar tissue and plica. That procedure was performed in July, and this fall Mirte hopes to return to an active lifestyle and move progressively into more ski-specific training.

"Smashing my knee on a rock wasn't, by itself, the cause of the problem," says Mirte. "It was the culmination of years of training and weaknesses, the straw that broke the camel's back."

Right at the outset, Mirte liked Dr. Sterett and his staff's friendly, caring and optimistic approach. "He encouraged me after trying everything under the sun to take the surgical step," says Mirte. "They are the true endurance athletes!"

"Dr. Sterett's insights in being able to read his patients and what they need are exceptional. I value his patience and willingness to have me integrate non-traditional medicine into my recovery program. He evaluated where I was skiing and my goals and said, 'We're going to get you back to your competitive level.' Hopefully that will be this coming season."

Mirte's plans? First, it will be back to training — and for cross-country skiing, that means hours upon hours of workouts to build up her aerobic base as well as the endurance in her knees. Depending upon how the fall unfolds, this winter will be one of base-building with her new alignment and, hopefully, skiing on the Dartmouth Carnival Team. "I'm realistically setting my sights on the NCAA's and returning to the Senior Nationals again — not for this season but for the following one, since that will give me time to rebuild," says Mirte. "This injury has been all about bringing everything into balance, both mentally and physically. You get on the right track with one knee, and you hope the other knee will catch up. It's a lot like striding and racing in a cross-country track."

Long term? "It's tough to say where I'm going to take cross-country," says Mirte, "especially after coming off an injury that has sidelined me for over a year. But cross-country is a passion and lifestyle for me. We'll just have to wait and see how far I can take the competition."

Marnie Hensel, 68, is also a skier, the kind who prefers going downhill — fast. And she's collected plenty of memories doing

it, most recently at the January 1999 Steadman-Hawkins All-Star Classic and at this year's NASTAR National Finals, where she finished sixth. "I met my goal," she says, "but next year I'm going to medal!"

Marnie lives in Wayzata, Minn., not far from Buck Hill, where she has skied most of her life. . . and trained. . . and met misfortune. In 1953, she broke her leg skiing, and she has undergone 45 operations on the same leg since. The problem was a staff infection that never went away — until Dr. Sterett examined her in the wake of a disastrous leg break in the finish line during last year's Steadman-Hawkins All-Star Classic. Dr. Sterett placed a rod in Marnie's tibia, put her on six weeks of powerful intravenous antibiotics to rid the staff infection, and prescribed several months of intensive water rehab.

"The rehabilitation wasn't all that different," says Marnie. "I had taught aerobics both in and out of the water. What was different was the mental rehab — learning to overcome the fear of reinjury. And that's what made going through the Steadman-Hawkins Clinic different. They treat the injury, yes, but they also treat you mentally as an athlete. They don't expect you to just get up and walk. They expect you to get up and walk and continue to do what it was you were doing before your injury."

It wasn't the first time Marnie had been to Steadman-Hawkins. "Among athletes, word gets around," she says, "and among the athletes I knew, the Clinic had a reputation of being the best."

Marnie's first visit to the Clinic, 10 years ago, was for a knee repair by Dr. Richard Steadman. "Dr. Steadman told me he wouldn't perform the operation unless I promised him I'd be on the rehab machine eight hours a day for eight weeks. That was quite a commitment — but I did it, and I've had no problems with my knee ever since. Dr. Steadman also

said 'I'm buying you time, Marnie — maybe eight to ten years.' Well, he bought me more time than what he promised. And I'm optimistic because by the time I need my knee replaced, the clinic will have advanced so far orthopaedically that my knee's usefulness should be assured for many more years."

What impresses Marnie, besides Steadman-Hawkins' rehab program — "They're at the absolute cutting edge of rehabilitation



Mirte Mallory, one of America's top cross-country skiing prospects.

research" — is Dr. Sterett. "In my opinion, Bill Sterett is one of the finest orthopaedic surgeons in the country, and I've sampled quite a few. He's a fabulous person, his skills, as a surgeon and as a person, are impressive — plus he tells it like it is. He's totally honest; he tells you what it is he's going to do, and if it doesn't work out, then he'll try something else."

Will the coming winter include the All-Star Classic? "I have no problems with either my leg or my knee," says Marnie. "I'm feeling great and I'll race again this season. I'm extremely grateful, because without the skills of the Steadman-Hawkins Clinic I wouldn't be able to do what I'm doing."

And she wouldn't be in contention for that medal. ■

(WEIGHT-BEARING EXERCISE from pg. 1)

to the gym and an ongoing media clamor over the next "easy route to fitness," we're just not doing it. Today's message for better health "get moving, and not in the car for a burger" is not new.

One simple solution to the current couch-potato lifestyle is weight-bearing exercise. It has been shown to significantly increase bone density, dramatically improve circulation and, in a relatively short time, revitalize aerobic health. Our definition of a weight-bearing exercise is anything you do carrying your own body weight, or using incremental weight, to improve the body's strength and endurance. These activities include walking, hiking, jogging, aerobics, dancing, snowshoeing, skiing (cross-country is one of the best weight-bearing exercises of all), weight training with free weights or resistance devices — the list goes on and on.

"LOADING UP"

The objective is to "load" muscles, bone and connective tissue by utilizing exercise that is fun and sustainable and has a positive effect on the body's overall integrity. Performing exercise using your own body weight or, in some cases, additional weight or resistance, in a full range of motion creates that load. This loading causes the body to work harder than when it is at rest and, in the process, increases its ability to work. That increase, in turn, strengthens, lengthens and makes every system in the body healthier.



Nationally ranked NASTAR skier, Marnie Hensel.

A program of weight-bearing exercise can include any combination of activities that works with your lifestyle. For instance, just as a start, three short walks a day, of only 15 minutes, will provide all the aerobic exercise most people need. Another warm-up exercise that is weight bearing and great for the legs is mini-squats. Standing with your feet shoulder-width apart and your hands on a chair, do three sets of eight double knee dips, not too deep. This will begin building strength in the legs and flexibility in the joints, both critical for good orthopaedic health. This exercise can be made more challenging by adding a resistance device to make the legs work harder.

In a more structured setting, doing a series of simple exercises in sets, with a prescribed number of repetitions per set, is the next step toward better fitness. The key to this kind of program is choosing exercises that safely work all parts of the body. And ignore the myth "No pain, no gain!" Pain is your body's message that you're in danger. If you don't listen, you will be injured. At the Steadman♦Hawkins Sports Medicine Foundation, our weight-bearing exercise rule is "If it hurts, you're doing it wrong."

Pure resistance training, a complement to weight-bearing exercise, is one of the best ways to safely improve strength and flexibility, both critical to good health. Resistance-exercise tools, such as simple elastic exercise devices, are easy to use, inexpensive and readily available, even over the internet. They are portable, so they can travel with you, and provide good balance to the walking, hiking, skiing, or jogging component of your new exercise program.

BASIC GUIDELINES

- Aerobic exercise should be done 3-4 days per week, with rest days in between. Begin with 10-15 minute sessions, and build to about 30 minutes per session.
- Resistance exercise should be done 2-3 days per week, also with a day in between. Doing 2-3 sets of 10-15 reps of each exercise should do the trick.
- The intensity of your exercise can be measured in either time, distance or fatigue. Keep track of how long it takes you to walk a given distance, how far you go in 10 minutes and how tired you are after each of your exercises. These benchmarks will tell you how much progress you're making toward a fitter body and will suggest when it's time to increase your program.
- Variety: Although not extensively studied, it is thought that varying your program from week to week will help you achieve your goals faster and maintain your interest and enthusiasm as well.
- Specificity: To adequately train for a given sport such as skiing, your training program should incorporate the body positions, muscle groups, type of movement and range of movement in that sport.

The objective is to "load" muscles, bone and connective tissue by utilizing exercise that is fun and sustainable and has a positive effect on the body's overall integrity.

BASIC GUIDELINES (cont.)

- Patience: Seeing results from your exercise program takes time and generally becomes evident after six weeks of regular training.
- Practice correct exercise technique. Trying to lift too much weight too fast, poor posture, performing an exercise in a limited range of motion, and holding your breath during exercise are detrimental to your physical outcome and health. Therefore, always warm up with light resistance and make sure you breathe throughout your exercise. Never be afraid to ask for assistance regarding technique, new ideas from experts or help from people that are around you.

We recommend that you consult your physician before beginning an exercise program. Be sure to warm up before you train and cool down afterward. Beyond your formal exercise program, think of ways to incorporate exercise into your normal routine. For instance, park in the back corner of the mall parking lot and walk to the store. Always use a bathroom on another floor and take the stairs. Carry packages from the store to the car instead of wheeling them in the cart. Every little bit of exercise counts.

There's no way to stop time. Getting older is a fact of life. But slowing its march in your body is something you can do. So get into the game. It will add life to your years and joy to your life. And if you want to know how to get started, give us a call or check our Web site at www.shsmf.org or www.toppersportsmedicine.com. ■

(VIRTUAL-KNEE PROJECT from pg. 1)



Van C. Mow, Ph. D.

Dubbed as "Our Virtual Knee" project, the process starts with a patient undergoing an MRI. Software written by Dr. Mow and his Columbia University team takes the MRI and creates a computer model of the patient's knee. This model is not merely the type of visual animation commonly seen in movies or on the Internet, but rather a model which has

built into it all of the laws of physics and mechanics. It also incorporates the shape and activity of the patient's muscles, showing where virtual forces will act in the model. Using electromyographical data, muscle activity will move the virtual-model knee.

The MRI-derived model has been shown to be extremely accurate 'better than 200 microns (width of hair)' at each and every point of the knee surface. The model also shows areas where the cartilage has been damaged during injury or arthritis. When a surgeon manipulates a patient's knee, the virtual knee of the patient can be seen to move on a computer screen precisely as the patient's knee moves. More importantly, the surgeon can try a number of surgical procedures on the patient's virtual knee and the computer program will predict all possible motions that the operated-on virtual knee will have. The model will also identify contact areas within the knee. In this way, the surgeon can plan and augment his clinical judgment to select the best possible procedure for a specific patient.

The virtual-knee project has many other possibilities, which will improve and expand the surgeon's skill. With an analytical probe, also developed by Dr. Mow and his group, surgeons will now be able to determine not only biomechanical qualities of damaged knee cartilage, but also its vital biochemical compositions. Both pieces of information are necessary for surgeons to assess with any reasonable assurance whether the patient's cartilage has been sufficiently damaged to require removal, or whether it is sufficiently healthy to survive in the otherwise arthritic joint. Together with the virtual knee model on a computerized screen in the operating theater, this analytical probe will provide the surgeon with a real-time tool that will visualize the entire surface of the joint, which normally is not visible, particularly during arthroscopic surgery.

A third area of potential use is in rehab therapy. Imagine now that the patient's virtual knee is connected to a rehab machine. Often the therapist does not know where the damage is within the knee. From MRI data, the therapist will have the ability to visualize the damaged areas on the cartilage surface. With this information, a rehab regime can be prescribed that will avoid high contact stresses from developing on the damaged cartilage surface. The virtual knee model will also provide an accurate prediction of muscle forces developed from the exercises so as to optimize muscle conditioning and strengthening.

Finally, one can readily see the value of the virtual knee for training orthopaedic residents, since arthroscopic surgery, for example, can be performed on the computer. When coupled with a dummy knee, the virtual knee can visualize the interior of the dummy knee being arthroscoped.

Several hurdles remain before such a scenario can become economically feasible. First is the transmission of MRI data from remote sites; this problem is particularly difficult because there are many MRI manufacturers and they are not all compatible. In other words, in order to process the electronic data, each machine needs to be programmed to create the virtual knee. Also, the quality and speed of transmission must be improved in order to create an accurate model. It is one thing to create an accurate model within one university, but it is quite another to create accurate virtual knee models from MRI data being sent, say, from Hong Kong. At present, efforts are being made to make the transmission of MRI data from the Steadman♦Hawkins Sports Medicine Foundation at Vail to Columbia University in New York, and we believe we will be able to accomplish this in the near future. Once we have shown the feasibility of creating an accurate virtual knee model from patient MRI data around the world, then the economic possibilities become enormous.

The collaboration between Dr. Steadman, the Foundation and Dr. Mow has been very productive and is still going strong. Progress for the future depends largely on the level of funding available to hire programmers and other researchers to actively develop the needed software and MRI modeling. The future is bright for this project, and the challenges are many and great. ■

Mark Your Calendar

The Steadman ♦ Hawkins Sports Medicine Foundation 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.

ADMINISTRATION

Charles J. Dillman, Ph.D.
Chief Executive Officer
Debbie Diamond
Director of Human Resources/Accountant
Karyll Nelson
BioSkills Laboratory Coordinator and Executive Assistant

DEVELOPMENT

John G. McMurtry, M.A., M.B.A.
Program Advancement
Patricia Herrington
Director of Development
Rachel Lenz
Development Associate/Grants Manager

BASIC SCIENCE

William G. Rodkey, DVM
Director

CLINICAL RESEARCH

Karen K. Briggs, M.B.A.
Director
Marilee Horan
Research Associate
Elizabeth McIrvin
Research Associate
Amy Ruther
Research Associate
Liss Gruen, J.D., M.D.
Research Intern

Ryan Marshall
Research Intern

Hillary Saxon
Research Intern

REHABILITATION/HUMAN

PERFORMANCE LABORATORY

Sherry L. Werner, Ph.D.
Director of Upper Extremity Research

Tricia Murray
Biomechanist, Upper Extremity Research Associate

Tim Cook, M.S.
Research Intern

Mike Torry, Ph.D.
Director of Lower Extremity Research

Mike Decker, M.S.
Staff Scientist Lower Extremity Research

EDUCATION

Holly Horvath
Coordinator

TECHNICAL RESOURCES

Jeffrey T. Whitman
Information Systems Manager

VISUAL SERVICES

George Peirce
Director

Jon Efraimson
Production Coordinator

November 26, 1999

Warren Miller's 50th Anniversary in film making, and presentation of the 17th Annual Halva International Skiing Award. Celebration, presentation, roast, dinner, the lodge at Vail. For more information, call Rachel Lenz, (970) 479-5786.

December 8-11, 1999

Tenth Annual Steadman Hawkins Fellows meeting. Steadman ♦ Hawkins Sports Medicine Foundation, Vail, Colorado. For more information, call Holly Horvath (970)-479-9797, ext. 5788.

February 11-14, 2000

Third Annual Steadman Hawkins All-Star Classic Ski Race, Beaver Creek, Colorado. Ski with Steadman Hawkins Olympic and World Champion Alumni. Event ends with a benefit concert by Phantom of the Opera Star, Steve Barton, on February 14. For more information, call Rachel Lenz, (970) 479-5786.

April 8, 2000

Warren Miller's Sixth Annual Mad Mountain Marathon. A day for the entire family to compete in the Rubber Legs 150 Giant Slalom Race on Vail Mountain, sponsored by WestStar Bank. Vail, Colorado. For more information, call Rachel Lenz, (970) 479-5786.

A growing popularity in estate planning today is living trusts. Like a will, you can utilize this instrument to stipulate how your property and other assets will be distributed to your family, friends and charitable interests. You can use a living trust to manage your property during your lifetime and make financial distributions. If you are considering this or any other planned estate methods, and the Steadman ♦ Hawkins Sports Medicine Foundation is among the charities you would like to benefit, it helps us to know for our future financial planning. If you would like to discuss this option, please contact Patricia Herrington (970) 479-9797 ext. 5271.



Steadman ♦ Hawkins
Sports Medicine Foundation

A 501(c) (3) Non-Profit Organization

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