Steadman◆Hawkins
Sports Medicine Foundation

ANNUAL REPORT 2002

Dedicated to Keeping People Active....

CONTENTS

The Steadman◆Hawkins Sports Medicine Foundation wishes to express 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 Foundation and operating room subjects.

Kelly is a renowned sports and stock photographer who approaches every photo shoot like a commando. His sense of motion combines with his obvious love of natural light to produce vibrant graphic images. He shoots extensively for a variety of prominent manufacturers in the sports and recreation industry; and his experience includes numerous assignments at the Olympics, Wimbledon, U.S. Open Golf, and World Cup Skiing. When Robert Redford needed a poster that reflected the spirit of his movie "A River Runs Through It," he called Kelly. More recently, Redford employed Kelly's photographic talents during the making of the "Horse Whisperer." Whether covering the Olympics or trekking in the Himalayas, Kelly is always ready for his next photographic adventure.

The Year in Review

As we look back on the year, we wish to thank our many donors and corporate sponsors who have supported our mission. Since our founding in 1988, nearly 1,800 individuals, foundations and corporate sponsors have made more than 5,000 gifts to the Foundation. At the same time as we recognize these friends, we also want to welcome a new corporate sponsor, Ormed, a German manufacturer and distributor of orthopaedic products.*

The year will be remembered as a period of progress and exciting development in our Basic Science research. Our collaborative effort with the Equine Science Center at Colorado State University has been devoted to unlocking the promise of gene therapy in treating cartilage defects. We are encouraged by these findings this year which indicate that by combining growth factors with gene therapy we can control the quality of cartilage repair tissue.

One of the important objectives of our research is to develop highly replicable surgical procedures that are minimally invasive. We have been involved in pioneering a system that helps simplify rotator cuff repair while aiming to match the outcomes of open procedures. Thanks to a series of groundbreaking biomedical innovations, this arthroscopic procedure has shown great promise.

Through our clinical research, we continue to learn from our patients. Our focus has been on determining predictors of disability and satisfaction, patient expectations, and patient outcomes from surgical procedures. In 2002, we completed several studies, such as those on Microfracture and Healing Response, that investigated the outcome of techniques developed here in Vail. In both cases, findings showed that patient activity level had increased and the patients were highly satisfied. We hope these and other outcomes will help establish future guidelines and expectations in the treatment of patients.

The quality of our research has attained a level of excellence recognized throughout the world. The American Society of Biomechanics selected an abstract authored by Biomechanics Research Laboratory Staff Scientist Kevin Shelburne, Ph.D., and Director Michael Torry, Ph.D., as winner in the 2002 *Journal of Biomechanics* Award competition. This is one of the most prestigious international awards conferred in Biomechanics.

An important part of our mission is education. In August we held the second International Cartilage Symposium. Sponsored by Pfizer, it was attended by more than 150 physicians and featured a world-renowned, international faculty of orthopaedic surgeons, each of whom has pioneered innovative procedures for treating articular cartilage injuries.

We also wish to recognize our staff, Fellows and principal investigators for the papers and studies they have published. Foundation principals published more than 25 papers and delivered 89 presentations worldwide. Additionally, nearly one-third of all of the educational videos accepted by the American Academy of Orthopaedic Surgeons at the 69th Annual Meeting in Dallas were produced by our Visual Services Department. Of these eight videos produced by the Foundation, one was an award winner. Since only 25 videos were accepted, this is a significant achievement.

Richard J. Hawkins, M.D. and J. Richard Steadman, M.D.

Inside this Annual Report, we take time to recognize some inspirational people who have not only benefited from the Foundation's work but have shown us that anything is possible when it involves the human spirit and the body's amazing ability to heal. We hope you will enjoy getting to know people like Olympian Bode Miller and singer/composer Judy Collins, who tell us their stories of overcoming difficult injuries at the peak of their careers. You will read about Air Force Major John Tokish, M.D., who immediately following his Fellowship year was dispatched to Afghanistan to become the first orthopaedic surgeon to command a Mobile Forward Surgical Team in the war zone. Many of the skills he learned during his Fellowship year were put into practice repairing soldiers from U.S. Special Operations.

All of these noteworthy achievements and uplifting stories would not be possible without considerable support. As we look back at the accomplishments of our 14th year and look to the future, we feel a deep sense of gratitude toward those friends who make our research and educational programs possible. On behalf of the Board of Trustees and staff, we wish to express our heartfelt and sincere appreciation to the many individuals, foundations, and corporations for their valued support.

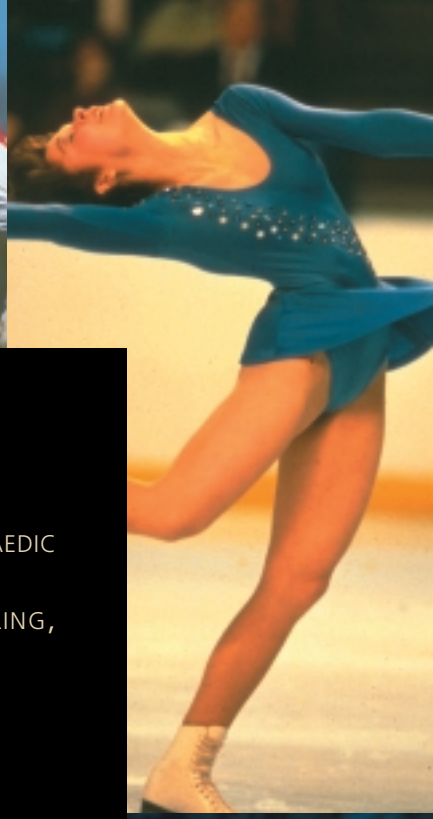
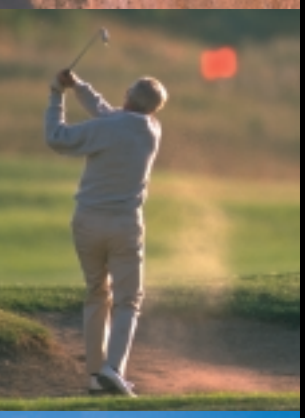
J. Richard Steadman, M.D.
Chairman

Richard J. Hawkins, M.D.
Vice President

James F. Silliman, M.D.
President and Chief Executive Officer

**The list of our other corporate supporters is found on page 13 of this 2002 Annual Report.*






Mission

KEEPING PEOPLE OF ALL AGES PHYSICALLY ACTIVE THROUGH ORTHOPAEDIC RESEARCH AND EDUCATION IN THE AREAS OF ARTHRITIS, HEALING, REHABILITATION, AND INJURY PREVENTION.

History

Founded in 1988 by orthopaedic surgeon Dr. J. Richard Steadman, the Foundation is an independent, tax-exempt (IRS code 501(c)(3)) charitable organization. The Foundation dedicates itself to finding solutions to orthopaedic problems that limit a person's ability to remain physically active. In fulfillment of its mission, the Foundation shares its findings with health-care professionals and the public in a variety of ways.

The Foundation is independent from, but works in association with, the Steadman-Hawkins Clinic. Dr. Steadman moved his medical practice from Lake Tahoe, Calif., to Vail, Colo., in 1990. He was joined by shoulder surgeon Dr. Richard J. Hawkins. Together they formed the Steadman-Hawkins Clinic.

As one of the largest independent orthopaedic research institutes in the world, the Foundation spends $2.5 million - $3 million annually—$25 million in the past 10 years—on research, education, and support programs. Procedures that surgeons use today were developed and perfected over many years in the Foundation's research and education environment.

The Foundation's work extends far beyond the patients and physicians in the greater Vail Valley. Every philanthropic dollar raised by the Foundation is used directly to advance scientific research and to support scholarly academic programs that train physicians for the future. Through its Fellowship program, the Foundation has now built a network of 120 Fellows and associates worldwide who share the advanced ideas and communicate the concepts they learned in Vail. The Foundation's primary areas of research and education are:

- Basic Science Research—Undertakes studies to investigate the mysteries of degenerative arthritis, cartilage regeneration and arthritic changes of the knee and shoulder.
- Clinical Research—Conducts "process" and "outcomes" research in orthopaedic sports medicine that will aid both physicians and patients in making better-informed treatment decisions.
- Biomechanics Research Laboratory—Performs knee and shoulder computer modeling and related studies in an effort to reduce the need for surgical repair.
- Education and Fellowship Program—Administers and coordinates the physicians-in-residence Fellowship program, hosts conferences and international medical meetings, and produces and distributes publications and videotapes.

GOVERNING BOARDS

Board of Directors

H.M. King Juan Carlos I of Spain
Honorary Trustee

Adam Aron
Chairman of the Board and Chief Executive Officer
Vail Resorts, Inc. – *Vail, Colo.*

Howard Berkowitz
Founder and Managing Partner
HPB Associates, L.P. – *New York, N.Y.*

Jeff Dorsey
President and Chief Executive Officer
HCA-HealthONE, LLC – *Denver, Colo.*

Julie Esrey
Board of Trustees
Duke University – *Kansas City, Mo.*

Jack Ferguson
Founder and President
Jack Ferguson Associates – *Washington, D.C.*

George Gillett
Chairman
Booth Creek Management Corporation
Vail, Colo.

Earl G. Graves
Publisher and Chief Executive Officer
Black Enterprise Magazine — *New York, N.Y.*

Ted Hartley
Chairman and Chief Executive Officer
RKO Pictures, Inc. – *Los Angeles, Calif.*

Susan Hawkins
Steadman-Hawkins Clinic
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colo.

Richard J. Hawkins, M.D.
Steadman-Hawkins Clinic
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colo.

The Honorable Jack Kemp
Director and Co-Founder
Empower America – *Washington, D.C.*

David Maher
General Partner, Chairman
DMM Enterprises, LLP – *Beverly, Mass.*

Arch J. McGill
President (retired)
AIS American Bell – *Vail, Colo.*

John G. McMillian
Chairman and Chief Executive Officer (retired)
Allegheny & Western Energy Corporation
Coral Gables, Fla.

Betsy Nagelsen-McCormack
Professional Tennis Player – *Cleveland, Ohio*

Cynthia L. Nelson
Cindy Nelson Ltd. – *Vail, Colo.*

Greg Norman
Professional Golfer – *Hobe Sound, Fla.*

Mary K. Noyes
Director of Special Services
Aircast, Inc. – *Freeport, Maine*

Al Perkins
Chairman
Darwin Partners – *Wakefield, Mass.*

Cynthia S. Piper
Trustee
Metropolitan State University Foundation of
Minneapolis – *Hamel, Minn.*

Steven Read
Read Investments – *Orinda, Calif.*

Damaris Skouras
Senior International Portfolio Manager
Morgan Stanley, Inc. – *New York, N.Y.*

Gay L. Steadman
Steadman-Hawkins Clinic
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colo.

J. Richard Steadman, M.D.
Steadman-Hawkins Clinic
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colo.

William I. Sterett, M.D.
Steadman-Hawkins Clinic
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colo.

John C. Tolleson
Chairman
Tolleson Group – *Dallas, Texas*

Stewart Turley
Chairman and Chief Executive Officer (retired)
Jack Eckerd Drugs – *Clearwater, Fla.*

Norm Waite
Vice President
Booth Creek Management Corporation – *Vail, Colo.*

Officers

J. Richard Steadman, M.D.
Chairman

James F. Silliman, M.D.
President

Richard J. Hawkins, M.D.
Vice President

John G. McMurtry
Secretary/Treasurer

Colorado Council

The Colorado Council was established as an auxiliary board of prominent Colorado citizens who serve as ambassadors for the Foundation within the state.

Bruce Benson
Benson Mineral Group, Inc. – *Denver*

Joan Birkland
Executive Director
Sports Women of Colorado – *Denver*

Robert Craig
Founder and President Emeritus
The Keystone Center – *Keystone*

Dave Graebel
Founder
Graebel Van Lines – *Denver*

John McBride
Aspen Business Center Foundation – *Aspen*

Charlie Meyers
Outdoor Editor
The Denver Post – *Denver*

Tage Pederson
Co-Founder
Aspen Club Fitness and Sports Medicine Institute
Aspen

Warren Sheridan
Alpine Land Associates, Ltd. – *Denver*

Vernon Taylor, Jr.
The Ruth and Vernon Taylor Foundation – *Denver*

William Tutt
Tutco, LLC – *Colorado Springs*

SCIENTIFIC ADVISORY BOARD

The Scientific Advisory Board consists of distinguished research scientists who represent the Foundation and serve as advisors in our research and education efforts, in our Fellowship program, and to our professional staff.

Steven P. Arnoczky, D.V.M.
Director, Laboratory for Comparative Orthopaedic Research
Michigan State University
East Lansing, Mich.

John A. Feagin, M.D.
Emeritus Professor of Orthopaedics
Duke University
Durham, N.C.

Richard J. Hawkins, M.D.
Steadman-Hawkins Clinic
Vail, Colo.

Charles Ho, M.D., Ph.D.
National Orthopaedic Imaging Associates
Sand Hill Imaging Center
Menlo Park, Calif.

Mininder Kocher, M.D.
Children's Hospital
Department of Orthopaedic Surgery
Boston, Mass.

C. Wayne McIlwraith, D.V.M., Ph.D.
Director of the Orthopaedic Research Laboratory
Colorado State University
Fort Collins, Colo.

Marcus Pandy, Ph.D.
Associate Professor, Biomedical Engineering
University of Texas/Austin
Austin, Texas

William G. Rodkey, D.V.M.
Director of Basic Science Research
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colo.

Juan J. Rodrigo, M.D.
Professor of Orthopaedic Surgery
University of California, Davis School of Medicine
Sacramento, Calif.

Theodore Schlegel, M.D.
Steadman-Hawkins Clinic
Denver, Colo.

J. Richard Steadman, M.D.
Steadman-Hawkins Clinic
Vail, Colo.

William I. Sterett, M.D.
Steadman-Hawkins Clinic
Vail, Colo.

Savio Lau-Yuen Woo, Ph.D., D. Sc. (Hon.)
Ferguson Professor and Director
Musculoskeletal Research Center
Department of Orthopaedic Surgery
University of Pittsburgh
Pittsburgh, Pa.

Photography: Karen Melhart

Scientific Advisory Board, rear, left to right: C. Wayne McIlwraith, D.V.M., Ph.D.; Charles Ho, M.D., Ph.D.; William I. Sterett, M.D.; Steven P. Arnoczky, D.V.M.; Mininder Kocher, M.D.; and J. Richard Steadman, M.D. Front row, left to right: Theodore Schlegel, M.D.; William G. Rodkey, D.V.M.; John A. Feagin, M.D.; Juan J. Rodrigo, M.D.; Savio Lau-Yuen Woo, Ph.D., D. Sc. (Hon.); and Richard J. Hawkins, M.D.

FRIENDS OF THE FOUNDATION

In 2002, we received contributions and grants from 769 individuals and foundations. This combined support, including special events, amounted to more than $ 1.2 million.

The Steadman◆Hawkins Sports Medicine Foundation is grateful for this support and to those who have entrusted us with their charitable giving.

We are especially pleased to honor the individuals, foundations, and corporations who have provided this support. Their gifts and partnership demonstrate a commitment to keep people active through innovative programs in medical research and education. Without this support, our work could not take place.

.

Hall of Fame

The Steadman◆Hawkins Sports Medicine Foundation is grateful to the following individuals, corporations, and foundations for their support of the Foundation in 2002 at a level of $50,000 or more. Their vision ensures the advancement of medical research, science, and care, as well as the education of physicians for the future. We extend our gratitude to these individuals for their generous support:

Mr. Herb Allen – Allen & Company

EBI Medical Systems, Inc.

HealthONE

Mr. Jim Kennedy – The Cox Foundation

NFL Charities

Dr. and Mrs. Glen D. Nelson

Nippon Sigmax Co. Ltd.

Pfizer, Inc.

Smith and Nephew Endoscopy

Sulzer Orthopedics Ltd.

Vail Valley Medical Center

Gold Medal Contributors

We are grateful to the following individuals, foundations, and corporations who contributed $20,000-$49,999 to the Foundation in 2002. Their continued generosity and commitment helps fund research in degenerative arthritis and train physicians for the future.

Aircast, Inc.

Mr. and Mrs. Harold Anderson

Mr. and Mrs. Howard Berkowitz

Mr. Douglas N. Daft

Mr. and Mrs. John Egan

Mr. and Mrs. Lawrence Flinn, Jr.

Mr. Warren Hellman

Mr. and Mrs. Walter Hewlett

Hugoton Foundation – Ms. Joan Stout

Innovation Sports

Mr. and Mrs. John W. Jordan II

Mr. and Mrs. Peter R. Kellogg

Mr. and Mrs. Henry Kravis

Mr. and Mrs. John McMillian

Mr. and Mrs. Ron Miller

Norman Family Charitable Foundation

Ormed GmbH & Co. KG

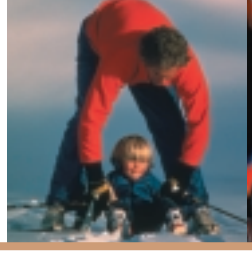
Mr. and Mrs. Steve Read

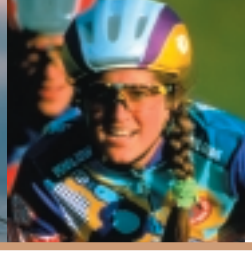
Seabourn Cruise Line

Dr. and Mrs. J. Richard Steadman

Dr. and Mrs. William I. Sterett

Mr. and Mrs. Randolph M. Watkins





The Founders' Legacy Society

Over the years, the Steadman◆Hawkins Sports Medicine Foundation has been privileged to receive generous and thoughtful gifts from friends and supporters who remembered the Foundation 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 Foundation, 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 to recognize 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 high-quality health care, treatment, and rehabilitation, and to providing education and training programs—is assured by the vision and forethought of friends and supporters who include us in their plans. The Foundation's planned-giving program was established to help donors explore a variety of ways to remember the Foundation.

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

Mr. and Mrs. Robert M. Fisher
Ms. Margo Garms
Mr. Albert Hartnagle
Mr. and Mrs. John McMurtry
Mr. and Mrs. Edward J. Osmers
Mr. Al Perkins
Mr. Robert E. Repp

Silver Medal Contributors

Silver Medal donors contribute $5,000-$19,999 annually to the Foundation. Their support makes it possible to fund research to develop new rehabilitation protocols for patients with ACL-reconstructed knees, to improve the effectiveness of knee braces, and to support the basic-science studies of healing factors and gene therapy. We extend our deep appreciation to the following individuals for their generous support in 2002:

Mr. and Mrs. Paul Baker
Mr. and Mrs. Erik Borgen
Mr. and Mrs. Robert A. Bourne
Mr. and Mrs. Chad Fleischer
Genzyme Biosurgery
Mr. and Mrs. George Gillett
Mr. Richard Goodman
Mr. and Mrs. Earl Graves
Mr. and Mrs. Gaines Hammond
Mr. and Mrs. Milledge Hart
Dr. and Mrs. Richard J. Hawkins
Mrs. Martha Head
Admiral and Mrs. Bobby Inman
Mr. and Mrs. J. B. Ladd
Mr. and Mrs. Kent Logan
Mr. Buck Lyon and Mrs. Laura Lee Lyon
Mr. Douglas Mackenzie
Mr. David Maher
Ernst and Wilma Martens Foundation
Jack C. Massey Foundation
Mr. and Mrs. Roy May
Mr. Charles McAdam
Mr. and Mrs. John McBride
The McCormack Foundation
Norman M. Morris Foundation
Mr. and Mrs. Greg Norman
Mr. and Mrs. Brian Noyes
Mr. and Mrs. Paul Oreffice
Mr. and Mrs. Bob Penkhus
Perot Foundation
Mr. and Mrs. Jay A. Precourt
Mr. and Mrs. Tom Quinn
Mr. and Mrs. Sanford Robertson
Mr. and Mrs. Arthur Rock
Ms. Alice Ruth and Mr. Ronald Alvarez
Mr. and Mrs. Larry W. Ruvo and Southern Wine & Spirits of Nevada
Mr. Jack Saltz
Dr. and Mrs. Theodore Schlegel
The Charles and Helen Schwab Foundation
Ms. Damaris Skouras
Slifer Family Foundation
Steadman-Hawkins Clinic
Mr. and Mrs. Vernon Taylor, Jr.
Mr. and Mrs. William R. Timken
Mr. John Tolleson
Mr. and Mrs. Stewart Turley
Mr. and Mrs. Norm Waite
Ms. Lucinda Watson
The Wheless Foundation
Ms. Mary Wolf
Mr. and Mrs. Steve A. Wynn

Bronze Medal Contributors

Medical research and education programs are supported by gifts to the Steadman◆Hawkins Sports Medicine Foundation's annual fund. The Bronze Medal level was created to recognize those patients and their families, trustees, staff, and foundations who contribute $10-$4,999 annually to the Foundation. Donors at this level support many programs, including the Foundation's research in degenerative arthritis and the development of gait retraining protocols for patients with ACL-reconstructed knees. We thank the following for their support in 2002:

Anonymous
Mr. Daniel Aboumrad
Mr. Richard Abrahams
Mr. and Mrs. Roger Affa
Mr. and Mrs. Ronald Ager
Mr. and Mrs. Gary Albert
Ms. Roxie Albrecht
Mr. and Mrs. John L. Allen
Mr. and Mrs. Richard Allen
Alpengold Studio in Beaver Creek
Alpenrose
Mr. Jos Althuyzen
Mr. Ohmer Anderson
Mr. Irving Andrzejewski
Applejack Wine & Spirit
Ms. Lottie B. Applewhite
Mr. Larry S. Arbuthnot
Mr. and Mrs. David B. Arnold, Jr.
Ms. Wendy Arnold
Mr. and Mrs. Adam Aron
Mr. and Mrs. John Atkins
Mr. and Mrs. Roger J. Attick
Mr. and Mrs. Lawrence E. Austin

Bronze Medal Contributors, continued

Mr. and Mrs. Mathew Autterson
Mr. and Mrs. John A. Baghott
Mr. Ronald P. Baker
Mr. David Balph
Mr. Herbert Bank
Mr. and Mrs. Richard Bard
Mr. and Mrs. John Barker
Mr. and Mrs. Bryant P. Barnes
Dr. and Mrs. Bill Barnhill
Mr. Alejandro D. Barroso
Mr. Carl A. Barrs
Ms. Karen Barsch
Mrs. Edith Bass
Ms. Ruth M. Baughman
Mr. and Mrs. Donald W. Baumgartner
Mr. and Mrs. John E. Beake
Beaver Liquors, Avon
Mr. and Mrs. Joachim Bechtle
Mr. Randall F. Bellows
Mr. Peter Benchley
Mr. Brent Berge
Mr. and Mrs. Brad Betz
Mr. Gene Bicknell
Dr. Peter Bidzilla
Mr. and Mrs. James Billingsley
Ms. Ella F. Bindley
Mr. and Mrs. Frank G. Binswanger, Jr.
Mr. and Mrs. Frank J. Biondi, Jr.
Ms. Joan Birkland
Mr. Robert A. Bissegger
Mr. and Mrs. Michael R. Black
Mrs. Elizabeth H. Blackmer
Mr. and Mrs. Doug Bleiler
Mr. and Mrs. Richard Blide
Ms. Margo A. Blumenthal
Mr. and Mrs. John A. Boll
Mr. and Mrs. B. R. Boniface
Mr. and Mrs. Wayne Boren
Dr. Martin Boublik
Dr. Dennis Bowman
Ms. Mary B. Bowman
Ms. Susan L. Brady
Mr. and Mrs. Robert L. Brand
Mr. David R. Braun
Breckenridge Outfitters
Mr. Dennis Brice
Mr. Robert S. Bricken
Mr. and Mrs. Bernard A. Bridgewater, Jr.
Ms. Karen Briggs and Mr. Daryn Miller
Mr. and Mrs. Ronald M. Brill
The Bristol
Mr. and Mrs. Michael C. Brooks
Mr. and Mrs. T. Anthony Brooks
Mr. and Mrs. C. Willing Browne III
Mr. John Bryngelson
Ms. Brenda A. Buglione
Ms. Marge Burdick
Mr. Kurt Burghardt
Ms. Dixie L. Burnett
Mr. and Mrs. Bill Burns
Mr. Wavell Bush
Mr. and Mrs. Sam Butters
Mr. and Mrs. James G. Buzalas
Mr. and Mrs. Rodger W. Bybee
Mrs. Nancy Byers
Ms. Julia Cahill
Canadian Mountain Holidays, Inc.
Mr. and Mrs. Thomas Carlisle
Mr. and Mrs. J. Marc Carpenter
Mr. Dennis E. Carruth
Mr. and Mrs. Michael J. Carusillo
Dr. Steve Carveth
Mr. Nelson Case
Mr. John A. Cavallaro
Ceramica, Vail
Mr. and Mrs. Pedro Cerisola
Ms. Judith B. Chain
Ms. Judy Chargot
Ms. Geni Chariker
Chateau Montelena Winery
Dr. Teresa Cherry
Mr. Victor Chigas
Mr. Martin D. Chitwood
Ms. Barrett Christy
Ms. Beverly A. Clasby
Ms. Caryn Clayman
The Club at Cordillera
Ms. Cynthia Coates
Mr. Ned C. Cochran
Mr. Jose Codner
Mr. and Mrs. Charles I. Cogut
Mr. and Mrs. Melvin Cohen
B. R. Cohn Winery
Ms. Betsy Cole
Mr. Samuel P. Cook
Dr. and Mrs. Donald S. Corenman
Country Club of the Rockies
Mr. and Mrs. Archibald Cox, Jr.
Ms. Patricia Craus
Dr. and Mrs. Frank Crnkovich

CHAIRS SUPPORT FOUNDATION WORK

The education of orthopaedic surgeons is a critically important mission of the Steadman◆Hawkins Sports Medicine Foundation. 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 130 Steadman-Hawkins 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 2002, seven chairs provided important funding for the Foundation's research and educational mission. We are most grateful for the support from the following:

Mr. and Mrs. Harold Anderson
Mr. and Mrs. Lawrence Flinn, Jr.
Mr. and Mrs. Jay Jordan
Mr. and Mrs. Peter Kellogg
Mr. and Mrs. Henry Kravis
Mr. Ron Miller
Mr. and Mrs. Steven Read

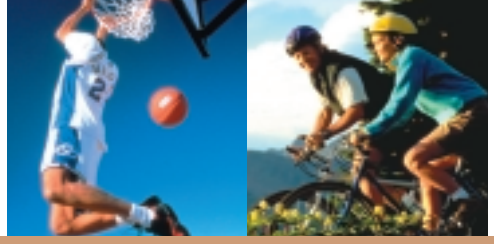
Bronze Medal Contributors, continued

Mr. and Mrs. Patrick B. Crotty
Mr. and Mrs. Leonard Crowley
Dr. Dennis Cuendet
Mr. and Mrs. Ralph B. Currey III
Mr. and Mrs. David L. Custer
Mr. and Mrs. David D'Ambrumenil
Mr. and Mrs. Daniel Dall'Olmo
Mr. and Mrs. Andrew P. Daly
Mr. Gordon Damon
Mr. and Mrs. Fred A. Dare
Mr. and Mrs. Darwin R. Datwyler
Jess Davila Studios
Mr. Ross M. Davis
Mr. and Mrs. Peter Dawkins
Mrs. Marilyn R. Dee
Ms. Danielle DenBleyker
Mr. and Mrs. Paul A. Denuccio
Mr. Jack Devine
Mr. Frederick A. Dick
Mr. and Mrs. Thomas R. Dickens
Diversified Radiology of Colorado
Ms. June M. Dobbs
Mr. Joseph Dolan
Mr. Stephen W. Dominick and Ms. Nicola Brew
Mr. Wayne B. Dondelinger
Mr. and Mrs. William J. Doré
Mr. Bob Dorr
Ms. Catherine Douglas
Mr. Geoffrey Drummond
Mr. Bob Dula
Mr. Robert B. Dunlop
Ms. Lois Dupont-Thomas
Dr. and Mrs. Peter M. Duvoisin
Dr. and Mrs. Jack Eck
Ms. Elaine G. Edinburg and Dr. Joel I. Kaye
Mr. Burton M. Eisenberg
Mr. and Mrs. Buck Elliott
Mr. and Mrs. Harry L. Ellis
Mr. and Mrs. Heinz Engel
Mr. and Mrs. Robert Epple
Mr. and Mrs. Chris Evans
Dr. and Mrs. Fred Ewald
Mr. and Mrs. Wylie Ewing
Exxon Mobil Foundation, Inc.
Ms. Ronelle Falls
Mr. and Mrs. William L. Fanning
Far Niente Winery
Dr. John A. Feagin
Mr. Harold B. Federman
Mr. and Mrs. Steve Fendrick
Mr. and Mrs. Jack Ferguson
Dr. and Mrs. Joe Ferrara
Ferrari Carano Winery
Mr. and Mrs. Ned Fine
Ms. Caroline Firestone
Dr. Thomas Fischer
Mr. and Mrs. John N. Fisher
Julian M. Fitch, Esq.
Mr. Herbert Fitz
Mr. and Mrs. Brian D. Fitzgerald
Ms. Holly Flanders
Mr. Dennis D. Flatness
Flora Springs Winery & Vineyards
Ms. Cynthia Florimont
Mr. and Mrs. David A. Forbes
Mr. Nathan M. Forbes
Mr. and Mrs. Walter A. Forbes
Pres. and Mrs. Gerald R. Ford
Dr. William R. Ford
Mr. and Mrs. Stephen Fossett
Mr. Richard L. Foster
Mr. and Mrs. Tom Francis
Ms. Anita Fray
Mr. and Mrs. Olin Friant
Mr. and Mrs. Gerald V. Fricke
Mr. David B. Friedland
Mr. and Mrs. Robert F. Fritch
Mr. and Mrs. Harry R. Fruehauf III
Ms. Alice A. Fryer
Mr. and Mrs. Richard Fulstone
Mr. and Mrs. Morton Funger
Mr. Shayne M. Gage
Mr. Damion Gallegos
Mr. Jorge A. Gaudiano
Ms. Louise Gengler
Mr. Ronald Gensburg
Mr. Jay C. Gentry
Mr. Egon Gerson
Mr. and Mrs. Bradley Ghent
Mr. Jack Gillespie
Mr. and Mrs. Herb Glaser
Mr. and Mrs. Jerome H. Goldberg
Mr. Michael Goldberg
The Golden Bear
Mr. David Goldstein
Mr. and Mrs. Richard Goldstein
Gore Range Mountain Works
Mr. James Gordon
Mr. John H. Gorman

FELLOWSHIP BENEFACTORS

Fellowship benefactors fund the research of one Fellow for one year at a level of $10,000. This is a fully tax-deductible contribution that provides an opportunity for the benefactor to participate in a philanthropic endeavor by not only making a financial contribution to the educational and research year but also to get to know the designated Fellow. Each benefactor is assigned a Fellow who provides written reports and updates of his work. We extend our gratitude to the following individuals for their generous support:

Mr. and Mrs. Milledge Hart
Mr. and Mrs. John W. Jordan
Mr. and Mrs. Kent Logan
Mr. Charles McAdam
Mr. and Mrs. Jay Precourt
Mr. Tom Quinn
Mr. and Mrs. Stewart Turley



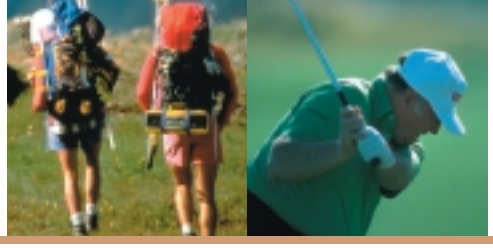
Bronze Medal Contributors, continued

Mr. and Mrs. Richard M. Goss
Mr. and Mrs. Paul Gotthelf
Gotthelf's Jewellers
Mr. Fredric H. Gould
Ms. Jean Graham
Mr. Robert W. Graham
Mr. and Mrs. Pepi Gramshammer
Mr. Wallace H. Grant
Mr. and Mrs. August Grasis
Mr. and Mrs. Edward S. Graves
Mr. Calvin Gray, Jr.
Mr. and Mrs. John D. Greaves
Mr. and Mrs. Robert G. Green
Mr. and Mrs. Anthony F. Greene
Mr. Gary G. Greenfield
Mr. Richard M. Gribble
Mr. and Mrs. Bill Griffith
Mr. Wayne Griffith
Mr. Peter V. Grimm
Mr. Neal C. Groff
Mr. and Mrs. Robert Grooters
Mr. and Mrs. Robert B. Gwyn
Mr. and Mrs. Steve Haase
Mr. and Mrs. Steve Haber
Dr. and Mrs. Topper Hagerman
Mr. and Mrs. Joe Haggar
Mr. Daniel T. Haggarty
Dr. and Mrs. Ralph Halbert
Mr. and Mrs. Laurice T. Hall
Mr. and Mrs. Thomas M. Hallin
Mr. Tod Hamachek
Mr. and Mrs. Curtis Hammond
Mr. and Mrs. D. L. Hanley
Ms. Carole A. Hansen
Mr. James E. Hanson II
Mr. Jon F. Hanson
Mr. Ian P. Harden
Mr. Kirk R. Hardie
Ms. Pat Harper
Mr. Densmore Hart
Ms. Esther N. Haskins
Mr. Ivan Hass
Mr. and Mrs. Harry L. Hathaway
Mr. and Mrs. Ron Hauptman
Mr. and Mrs. Edward Hauser
Mr. R. Neil Hauser
Mrs. Horace Havemeyer, Jr.
Mrs. Marian Hawkins
Ms. Rosemary Hawkins
Ms. Beverly E. Hay De Chevrieux
Ms. Elise Hayes
Ms. Lynne Heilbron
Mr. John M. Henry
Mr. George Henschke
Dr. and Mrs. Alfred D. Hernandez
Mr. Mark D. Herrero and Ms. Jan L. Booth
Mr. Gerald Hertz and Ms. Jessica Waldman
Mr. and Mrs. Gordon A. Heuer
Ms. Barbara B. Hibben
Mr. James E. Hicks
Ms. Carol Hiett
Mrs. Cortlandt Hill
Ms. Lyda Hill
Mr. Jaren Hiller
Mrs. Joy R. Hilliard
Mr. Art Hilsinger and Ms. Barbara Janson
Ms. Kathleen J. Hilton
Mr. John Hire
Mr. Charles Hirschler and Ms. Marianne Rosenberg
Dr. Charles Ho
Mr. and Mrs. David Hoff
Mr. George R. Hoguet
Mr. and Mrs. Martin Hollay
Mr. and Mrs. Michael D. Hollerbach
Mr. Brandon J. Holtrup
Mr. and Mrs. Terry L. Holtzinger
Mr. and Mrs. Charles Hoover
Mr. Preston Hotchkis
Mr. and Mrs. Phillip E. Hoversten
Mr. and Mrs. David G. Howard
Mr. Kevin Howe
Mr. and Mrs. Thomas H. Hudson
Ms. Constance W. Huffman
Peter Hughes Diving
Mr. Alexander B. Hume
Mr. and Mrs. George H. Hume
Mr. and Mrs. Walter Hussman
Mr. and Mrs. Paul H. Huzzard
Mr. and Mrs. Dunning Idle IV
Mr. and Mrs. Michael Immel
Mr. Joe R. Irwin
Mr. Arnold Jaeger
Ms. Mary H. Jaffe
Mr. and Mrs. John V. Jaggers
Dr. and Mrs. Arlon Jahnke, Jr.
Mr. and Mrs. L. R. Jalenak, Jr.
JanSport
Mrs. Glenn Janss
Mr. Bill Jensen and Mrs. Cheryl S. Armstrong-Jensen
Mr. and Mrs. Jerrold Jerome
Jewels by Shilpi, Beaver Creek
Mr. Anders Johansson

FELLOWS SOCIETY

The Fellows Society was created to recognize former Steadman-Hawkins Fellows who have made an annual pledge to the Foundation of $1,200 or more. Members of the Society will help ensure the tradition of excellence in orthopaedic training and education. They receive benefits that include access to Foundation research and projects, access to our audio-visual department and tape library, and invitations to all Foundation events. We extend our deep appreciation to the following physicians for their generous support in 2002:

Dr. William Barnhill
Dr. Martin Boublik
Dr. Arlon Janke
Dr. Sumant G. Krishnan
Dr. Peter McDonald
Dr. Jim Montgomery
Dr. Thomas Noonan
Dr. John Peloza
Dr. Andrea Saterbak
Dr. Theodore Schlegel
Dr. James F. Silliman
Dr. Steve B. Singleton
Dr. William I. Sterett



Bronze Medal Contributors, continued

Mr. Calvin R. Johnson
Mr. and Mrs. Charles Johnson
Ms. Linda A. Johnson
Mr. and Mrs. Howard J. Johnston
Ms. Charlotte H. Jones
Mr. and Mrs. Jack Jones
Mr. and Mrs. Laurence R. Jones, Jr.
Mr. and Mrs. Darrell L. Jordan
Mr. Steve Jordan
Dr. and Mrs. Jay Kaiser
Dr. George C. Kaplan
Ms. Sara Karabasz
Karats
Mr. and Mrs. Jaroslav Karpa
Ms. Beth Kasser
Mr. and Mrs. Bruce Kasson
Mr. and Mrs. Joel M. Kaufman
Mr. George M. Kaye and Ms. Harriet Washton
Ms. Michelle Keel
Mr. and Mrs. Raymond Kelley
Mr. Charles G. Kellogg
Mr. and Mrs. Roger W. Kendall
Mr. and Mrs. David V. King
Mr. and Mrs. Skip Kinsley, Jr.
Mr. Walter Kirkham
Steven and Michele Kirsch Foundation
Mr. and Mrs. Stewart C. Kissinger
Mr. Kevin R. Klein
Miss Jane Klopatek
Mr. and Mrs. Peter Knoop
Ms. Gwyn Gordon Knowlton
Dr. Mininder Kocher
Ms. Brigitte E. Kopper
Ms. Lauri Korinek
Mr. Jack Koson
Mr. and Mrs. Bob Krohn
Mr. and Mrs. John Kurdilla
Mr. Dennis Kurpius
Mr. James Kurtz
Mr. and Mrs. G. Siegfried Kutter
La Tour Restaurant
Ms. Evelyn L. Lail
Mr. George Lamb
Mr. and Mrs. S. Robert Landie
Larkspur
Mr. Olle Larsson
Mr. Chester A. Latcham
Ms. Judith Layton
Ms. Joan Leader
Mr. and Mrs. Dan Leever
The Left Bank
Mr. John E. Leipprandt
Mr. and Mrs. Robert Lemos
Mr. and Mrs. Theodore D. Less
Brig. Gen. Samuel K. Lessey, Jr.
Mr. and Mrs. Trudo T. Letschert
Mr. Burton Levy
Mr. Kevin Lilburn
Mr. and Mrs. William G. Lindsay, Jr.
Mr. and Mrs. Dave Liniger
Ms. Linda Litchi
Mr. Paul Litowitz
The Lodge at Vail
Mr. and Mrs. Walter Lowenstern

NATIONAL FOOBALL LEAGUE CHARITIES

For the 11th consecutive year, NFL Charities, the charitable foundation of the National Football League, has awarded a substantial research grant to the Steadman◆Hawkins Sports Medicine Foundation for new and continuing work on the causes, treatments and prevention of sports-related injuries. The research project, "Force in the Upper Extremity Muscles with Intact and Ruptured Biceps Tendons: Part II," is a continuation of a 2002 grant from NFL Charities to broaden our knowledge of how to treat biceps tendon injuries. The principal investigators are Drs. Richard J. Hawkins, Kevin B. Shelburne and Michael R. Torry of the Foundation, and Dr. Marcus Pandy of the University of Texas.

The study will utilize a sophisticated model of the upper extremity to quantify and explain the roles of the individual muscles of the shoulder and elbow in standard motions. This computer model was developed by Dr. Marcus Pandy and Dr. Brian Garner at the University of Texas at Austin. The goal of this investigation is to quantify the functional roles and interactions of the biceps tendons (long head and short head) and the subscapularis muscle on glenohumeral joint reaction forces during active arm motions. This study will help in the understanding of the specific role and relative contributions of the subscapularis to shoulder stability and function in an intact shoulder, and a biceps-ruptured and tenodesed shoulder, allowing physicians to inform patients of the relative risks and benefits of both conservative and surgical treatment.

Upon completion, this project will be one of the most comprehensive analyses of the functional role of the biceps brachii muscle and subsequent treatments, both surgical and conservative, as well as the functional roles of the subscapularis rotator cuff muscle in normal and abnormal glenohumeral joint function.

This joint research effort between the University of Texas and the Steadman◆Hawkins Sports Medicine Foundation has already produced several quality abstracts that were recently presented by Takashi Yanagawa, M.A. (currently full-time Staff Scientist of the Foundation and former student of Dr. Pandy). "The next year and a half will be very exciting for us, as this research is beginning to capture the attention of noted shoulder specialists around the world," states Dr. Torry. "This type of research is no small endeavor and we are extremely proud of Takashi and the strides he and his collaborators at the University of Texas have made in developing and applying one of the world's most comprehensive shoulder models in orthopaedics today."

Bronze Medal Contributors, continued

Lord Gore
Ms. Eileen Lordahl
Mr. and Mrs. Thomas L. Lupo
Mr. Gerard Lynch
Dr. and Mrs. Peter MacDonald
Mr. John MacLean
Ms. Jane G. Madry
Mr. and Mrs. Michael J. Maguire
Mr. and Mrs. James Mahaffey
The Mailman Foundation, Inc.
Ms. Sylvia Malinski
Mr. Theodore Mallon
Ms. Julie Mandt
Dr. Roger Mann
Mr. and Mrs. Charles Manning
Ms. Sylvia Manning
Mr. Gilbert Y. Marchand
Mr. Stewart Marcus
Ms. Adrienne K. Marks
Mr. Herbert E. Marks
Ms. Marjorie Marks
Mr. and Mrs. Mike Marsh
Mr. and Mrs. Rocco J. Martino
Ms. Patricia L. Marx
Masato's Sushi & Japanese Bistro
Ms. Miko Mayama-Erlichman
Mr. and Mrs. David Mazer
Mr. and Mrs. Charles V. McAdam
Mr. and Mrs. Frank G. McAdam
Ms. Mary McClure
Mr. Donald S. McCluskey
Mr. Rick McGarrey
Mr. and Mrs. John W. McGee
Mr. and Mrs. E. G. McGhee, Jr.
Mr. and Mrs. Arch McGill
Mr. and Mrs. James M. McKenzie
Dr. Jary McLean
Mr. and Mrs. John G. McMurtry
Dr. Lee McNeely
Mr. and Mrs. Frank N. Mehling
Mr. and Mrs. Eugene Mercy, Jr.
Mr. and Mrs. F. H. Merelli
Mr. Ron Michaud
Mr. George Middlemas
Mr. Andy Mill and Ms. Chris Evert
Mr. Dan Miller
Mr. and Mrs. Warren Miller
Dr. Michael J. Milne
The Minneapolis Foundation
Mr. and Mrs. Allan Mirkin
Ms. Anni D. Mitchell
Mr. and Mrs. David Mittelman
Mr. Ronald Mobley
Mr. Harold Molloy
Dr. Jim Montgomery
Mr. Alan D. Moore
Gordon and Betty Moore Foundation
Mr. Jim Moran
Mr. and Mrs. Jean-Claude Moritz
Mr. and Mrs. John H. Morris
Mr. and Mrs. James Morter
Mr. and Mrs. William Morton
Ms. Myra D. Mossman
Dr. and Mrs. Van C. Mow
Mr. Neil Muncaster
Ms. Bonnie E. Murray
Mr. Jonathan P. Myers
Myers Financial Corporation
Mr. and Mrs. Trygve E. Myhren
Dr. and Mrs. Richard K. Myler
Dr. and Mrs. R. Deva Nathan
Mr. and Mrs. Robert Neal
Ms. Cindy Nelson
Mr. R. A. Nelson
Mr. Josef Neubauer
Dr. Todd Neugent
Mr. Quy Nguyen
Ms. Susan Nichols
Mr. and Mrs. Denny N. Nielson
Ms. Catherine Nolan
Dr. and Mrs. Thomas Noonan
Mr. Charles Norton, Jr.
Ms. Colleen K. Nuese-Marine
Mr. Edward D. O'Brien
Mr. and Mrs. Tom O'Dwyer
Mr. Larry O'Reilly
Mr. Dan O'Rourke
Mr. and Mrs. Raymond J. Oglethorpe
Mr. and Mrs. Edward J. Osmers
Mr. John Osterweis
Marcus G. Pandy, Ph.D.
Mr. and Mrs. Preston Parish
Mr. and Mrs. Roger Parkinson
Ms. Carol S. Parks
Mr. and Mrs. William K. Parsons
Dr. and Mrs. Scott Paschal
Ms. Michelle S. Payne
Ms. Mary Payson
Pearlstone Family Fund
Mr. and Mrs. Tage Pedersen
Mr. and Mrs. James Pefanis
Ms. Martha Pegg
Dr. and Mrs. John Peloza
Mr. and Mrs. Ralph Pelton
Mr. Mark Penske
Mr. and Mrs. Don Perozzi
Mr. Eugene Petracca
Ms. Mary A. Pflum
Mrs. Allan Phipps
Ms. Jan Rymer Pickens
Mr. and Mrs. Addison Piper
Plata, Crossroads in Vail
Ms. Margie Plath
Mr. and Mrs. Charles W. Plett
Mr. and Mrs. Roy R. Plum
Dr. Robert H. Potts, Jr.
Mr. Douglas Powell
Mrs. Ashley H. Priddy
Mr. and Mrs. Tom Pritzker
Ms. S. Hannah Prowse
Mr. W. James Prowse
Mr. and Mrs. Brad Quayle
Mr. and Mrs. Paul Raether
Mr. and Mrs. David Raff
Mr. Carl Rand
Ms. Mary Randall
Mr. and Mrs. Marshall Rayard
Ms. Anne D. Reed
Ms. Lorraine M. Remza
Mr. and Mrs. Douglas J. Renert
Mr. Luis A. Renta
Ms. Ann Repetti
Mr. John Ricciardi
Mr. Henry F. Rice
Mr. and Mrs. C. R. Riddle
Ristorante Ti Amo
Mr. and Mrs. Wayne A. Robins
Ms. Judy Robinson
Dr. William Rodkey
Dr. and Mrs. Juan J. Rodrigo
Mr. and Mrs. R. J. Rogers
Mr. Daniel G. Roig
Mr. Alejandro Rojas
Dr. Kevin Roley and Dr. Kate Skaggs
Ms. Margaret A. Rooney
Mr. and Mrs. Michael Rose
Rosenberg Builders Supply, Inc.
Rosenblum Cellars
Mrs. Ann M. Ross
Ms. Mildred E. Roth
Mr. Gary L. Roubos
Mr. Leroy Rubin
Mr. and Mrs. Keith E. Rubio
Rudd Foundation
Rudd Vineyard & Winery

Bronze Medal Contributors, continued

Mr. and Mrs. Stanley Rumbough, Jr.
Mr. and Mrs. L. James Runkle
Mr. and Mrs. Thomas L. Russell
Mrs. Helen M. Rust
Mr. Herbert E. Sackett
Ms. Jolanthe Saks
Dr. Henry Salama
Mr. and Mrs. Don Salem
Mr. Peter Sallerson
Mr. Thomas C. Sando
Mr. and Mrs. Steve Sanger
Dr. Andrea Saterbak and Mr. Matthew McGuire
Mr. Tom Saunders
Mr. William D. Schaeffer
Mr. Benjamin S. Schapiro
Mr. Tom Scharf
Mr. and Mrs. Bob Schlegel
Ms. Kathryn S. Schmoll
Mr. William Schneiderman
Mr. Emil R. Schnell
Mr. and Mrs. Alvin Schonfeld
Mr. and Mrs. Tom Schouten
Mr. and Mrs. Bruce Schuster
Mr. and Mrs. Bob Seeman
Mr. and Mrs. Gordon I. Segal
Ms. Christianna E. Seidel
Mr. Phillip E. Seigenfeld
Mrs. Joann Sessions
Mr. O. Griffith Sexton
Mr. Brendan J. Shannon
Ms. Sylvia Shapiro
Mr. Warren Sheridan
Ms. Betty J. Shiffrin
Dr. and Mrs. Jeffrey Shiffrin
Mr. and Mrs. James Shpall
Ms. Eva M. Siekierski
Mr. Mort Silver
Silver Oaks Cellars
Mr. and Mrs. John Simon
Mr. Harvey Simpson
Dr. and Mrs. Steve B. Singleton
Mr. and Mrs. Mac J. Slingerlend
Ms. Suzanne Sloan
Mr. Edmond W. Smathers
Ms. Claudia Smith
Mr. and Mrs. Paul Smith
Ms. Suzanne Smith
The Patricia M. & H. William Smith, Jr. Foundation
Ms. Julie Snyder
Sonnenalp of Vail Foundation
Mr. James L. Spann
Ms. Leslie B. Speed
The Spiritus Gladius Foundation
Splendido At The Chateau
Mr. Frank P. Spratlen
Mr. and Mrs. J. Michael Spriggs
Mr. and Mrs. Richard Stampp
Steadman◆Hawkins Sports Medicine Foundation
Mr. and Mrs. Lyon Steadman
Ms. Mary Steadman
Mr. Keith Stein
Mr. and Mrs. Gerald Stempler
Mr. John Stern
Ms. Mary Stitgen
Mr. Hans Storr
Mr. John A. Strache
Mr. and Mrs. Albert I. Strauch
Dr. and Mrs. Barry S. Strauch
Mr. and Mrs. Eric Strauch
Ms. Picabo Street
Mr. and Mrs. Larry Strutton
Mr. and Mrs. Steven C. Stryker
Mr. Scott Stuart
Mr. and Mrs. B. K. Sweeney, Jr.
Sweet Basil
Dr. William Swetlik
Mr. and Mrs. Mark Tache
Mr. and Mrs. Oscar L. Tang
Tannen Family Foundation
Mr. and Mrs. George Tauber
Mr. Stephen M. Tenney
Mr. Tim Tenney
Terra Bistro
Ms. Elizabeth W. Tewell
Mr. and Mrs. William B. Thetford
Jarrett "JJ" Thomas
Mr. Terry Thomas
Ms. Margaret D. Thompson
Mr. Wray T. Thorn and Ms. Melissa Francis
Mr. and Mrs. Douglas M. Tisdale
Mr. Mark Train
Mr. Dan E. Trygstad
Mr. William Tutt
Mr. John L. Tyler
Tyrolean
Ms. Stephanie Uberbacher
Vail Cascade Resort & Spa
Vail Resorts
Vail Valley Medical Center Foundation
Mr. and Mrs. John A. Vance
Vanoff Family Foundation
Mr. and Mrs. Leo A. Vecellio, Jr.
Mr. and Mrs. James F. Vessels
Ms. Sandra Vinnik
Mr. and Mrs. David S. Vogels
Mr. and Mrs. Charles S. Von Stade, Jr.
Mr. and Mrs. George Vonderlinden
Mr. and Mrs. Edward H. Wahtera
Mr. and Mrs. Charles Waite
Mr. Martin Waldbaum
Dr. and Mrs. Mark H. Wall
Mr. and Mrs. Andy Wallace
Ms. Pamela O. Wallen
Mr. Bill Walsh
Mr. and Mrs. Seth Ward
Mrs. Del La Verne Watson
Mr. and Mrs. Robert P. Watson
Mr. Thomas Weisel
Mr. and Mrs. Lawrence Weiss
Mr. John Welaj
Mr. and Mrs. Patrick Welsh
Mr. George Wiegers
Mr. Donahue L. Wildman
Ms. Sara Will
Ms. Diana G. Williamson
Mr. Richard E. Williamson
Mr. and Mrs. Bryan E. Wiman
Dr. and Mrs. Jorge Winkler
Mr. David Winn
Winter Park Ski Area
Mr. Richard E. Witte
Mr. Richard Wohlen
Mr. Willard E. Woldt
Dr. and Mrs. Savio L. Y. Woo
Dr. and Mrs. Chip Woodland
Mr. and Mrs. Gary Worth
Mr. Oliver Wuff and Ms. Monika Kammel
Mr. and Mrs. Robert W. Yank
Mr. Henry Yost
Mr. and Mrs. Jack Zerobnick
Reverend and Mrs. John Ziegler

CORPORATE AND INSTITUTIONAL FRIENDS

The Steadman◆Hawkins Sports Medicine Foundation is grateful for the generous support of our corporate donors. In 2002, we received $1 million in corporate support to help fund the Foundation's research and education programs in Vail, Colo., and at six university sites. This work will benefit patients and physicians for generations to come.

- **Aircast, Inc.**
- **EBI Medical Systems. Inc.**
- **Innovation Sports**
- **Nippon Sigmax Co. Ltd.**
- **Ormed, GmbH & Co. KG**
- **Peak Performance Technologies, Inc.**
- **Pfizer, Inc.**
- **Smith & Nephew Endoscopy**
- **Sulzer Orthopedics Ltd.**
- **HealthONE Alliance**
- **Vail Resorts, Inc.**
- **Vail Valley Medical Center**

ORMED JOINS FOUNDATION AS CORPORATE SPONSOR

Ormed, GmbH & Co. KG, a manufacturer and distributor of orthopaedic and sports medicine products based in Fribourg, Germany, has joined the Steadman◆Hawkins Sports Medicine Foundation as a corporate sponsor.

Founded in 1992, Ormed has a staff of 130 and operates three subsidiaries and 65 distribution centers throughout Germany. The company specializes in manufacturing and distributing passive-motion devices and other therapeutic systems, braces, and splints. It has also developed breakthrough surgical technology in cartilage repair. The company is a market leader in Germany in the field of continuous passive-motion devices.

Says Frank Bömers, Ormed director of marketing, "Our cooperation with the Steadman◆Hawkins Sports Medicine Foundation marks a new era as we strive for excellent medical products and services."

Bode Miller: Healing Response and the Comeback Kid

By Richard Needham

The following profile is based on an interview by Richard Needham. Mr. Needham is editor of "Skiing Heritage" magazine and the health newsletter "Arthritis Advisor."

Call it coincidence, but it seems every time world-class athletes in need of a body repair visit Steadman-Hawkins—Bruce Smith, Dan Marino, Joe Montana, Phil Mahre, Steve Mahre, John Elway, Picabo Street, Greg Norman—they return to the playing field in better shape than when they were competing at even their highest level.

Witness Bode Miller. In 2000-2001, the soon-to-be ski-racing phenom already had one World Cup podium finish (giant slalom) and was primed for a big result at the combined downhill/slalom event in St. Anton, Austria. He was fourth in the slalom going into the downhill, but 30 seconds into the downhill course Bode hooked an edge at 80 miles an hour, careened off the course, and crashed into a fence. Result: a complete ACL tear of the left knee coupled with damage to the meniscus. The likely fix: total ACL reconstruction, with an extended rehab period that such a surgery would require.

But something happened along the way. Dr. Steadman opted to use a revolutionary new procedure that he had developed. During Bode's meniscus repair, he performed the "healing response." This arthroscopic procedure involves making three to 10 small "microfracture" holes in the bone at the femoral origin of the injured ACL. The blood clot from the bleeding bone captures the injured end of the ACL and eventually reattaches the ligament back to the bone. The healing response has many advantages, including a much shorter recovery period, less cost, and because it is less invasive, greatly reduced chances for osteoarthritis to set in later.

Three weeks following his surgery, Bode was fully mobile and without need of a brace. Encouraged, Dr. Steadman suggested waiting another three weeks to determine whether the healing response would take. When the three weeks were up, the news was even more encouraging. "My ACL," says Bode, "was re-growing entirely on its own." By July, Bode was back on skis once again, training at Mt. Hood, Ore., and "feeling 100 percent, going right after it right away." In the season's first World Cup giant slalom in Solden, Austria, Bode finished a remarkable fifth—eight months after his surgery. Bode's new knee—and his determination to "go right after it" paid off big last season, with four World Cup victories, a second in the World Cup slalom standings, a fourth in the overall World Cup standings, and two silver medals at the Salt Lake Winter Olympics.

For most, those kinds of results would rank high in the memory bank. For the 25-year-old from Franconia, N.H., however, his most memorable moment was the day he made the U.S. Ski Team. Competing in the U.S. National Championships at Sugarloaf, Maine, Bode came from 30th position in the slalom to capture third. "My family was there, all my classmates were there," says Bode. "It was the greatest!"

When Bode isn't on the course, he's on the court. An all-state tennis player, he has been a coach and counselor at the family's Tamarack Tennis Camp for years and, as this is written, is "just trying to relax and get the energy systems back up."

"Tennis," says Bode, "is a great mental exercise. It's a longer event than ski racing and it helps you stay focused for a longer period of time." But wait, there's more. Golf, for example. A low- to mid-70s shooter, Bode took up the game at 15 but didn't "get serious" about golf until five years ago. "I really enjoy the game," he says. "When I retire from ski racing, I'd like to play tournament golf—if I still have the competitive energy."

Competitive energy isn't something that Bode is likely to run out of anytime soon. The 2006 Winter Olympics are still ahead ("It's a long way away, but I plan to be there") and he's already looking to compete in tournament tennis if he can bring in some major events locally ("It's important for the kids to see their coaches compete").

Besides, he always has the comfort of knowing that the staff at Steadman-Hawkins will be there to make sure the physical part is up to the energy part. "Dr. Steadman and his staff," says Bode, "are the greatest—supportive and super-friendly. It makes a nice environment to be in when you're injured, bummed out, and trying to keep your spirits up."

The Steadman◆Hawkins Sports Medicine Foundation is key to the medical breakthroughs that have brought athletes, like Bode Miller, back to their best. It provides the research environment in which important new procedures, such as the healing response, are developed, nurtured, tracked and refined to promote top-of-the-game performance—for world-class competitors and weekend warriors alike.

Photography: AP/Wide World Photos

BODE MILLER

The Steadman◆Hawkins Sports Medicine Foundation is key to the medical breakthroughs that have brought athletes, like Bode Miller, back to their best. It provides the research environment in which important new procedures, such as the healing response, are developed, nurtured, tracked and refined.

HEALING RESPONSE: STIMULATING REPAIR OF ACL INJURIES.

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

Dr. Rodkey is director of Basic Science Research for the Steadman◆Hawkins Sports Medicine Foundation.

Defects in the anterior cruciate ligament (ACL) rarely heal spontaneously. The torn ACL sometimes scars to the posterior cruciate ligament (PCL), but this does not result in any significant biomechanical function. ACL injuries continue to present a difficult problem for orthopaedic surgeons because it is difficult to predict whether such injuries will cause severe disability or only minimal impairment.

Consequently, Dr. Steadman has developed a procedure 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 seen in skiers. It is minimally invasive and uses the microfracture awl arthroscopically to produce a "superclot" 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 and heal the torn ACL.

We believe that the healing response procedure has significant advantages that outweigh the potential disadvantages. It is a technically easy procedure for the surgeon to perform with minimal downside risk.

Rehabilitation The Best Medicine

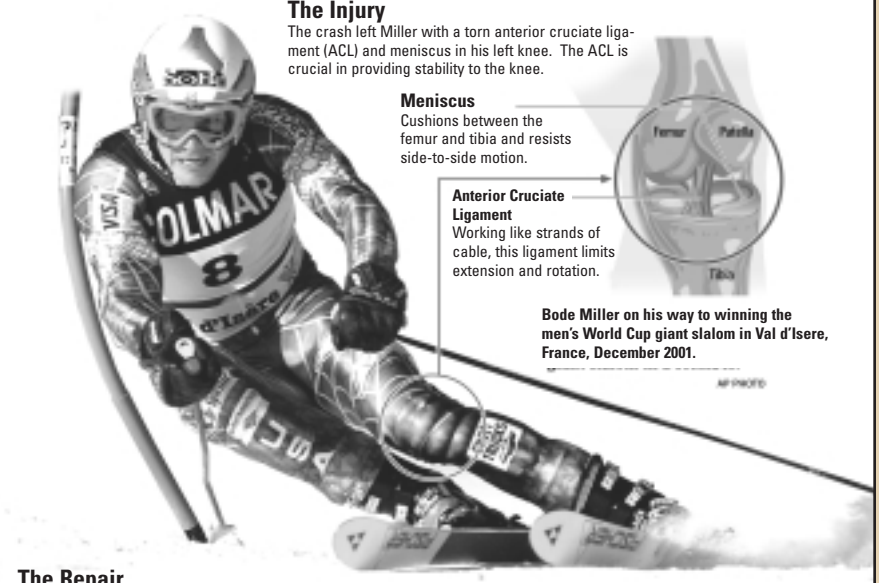
Bode Miller suffered a torn anterior cruciate ligament in a downhill crash in February 2001 at the World Alpine Championships in Austria and was able to come back for the Olympic year in 2002 thanks to the "healing response" procedure and a heavy exercise program. And to put an exclamation mark on his miraculous recovery, Miller responded with four World Cup victories, a second in the World Cup slalom standings, a fourth in the overall World Cup standings, and two silver medals at the Salt Lake City Winter Olympics.

The Injury

The crash left Miller with a torn anterior cruciate ligament (ACL) and meniscus in his left knee. The ACL is crucial in providing stability to the knee.

Meniscus
Cushions between the femur and tibia and resists side-to-side motion.

Anterior Cruciate Ligament
Working like strands of cable, this ligament limits extension and rotation.



Bode Miller on his way to winning the men's World Cup giant slalom in Val d'Isere, France, December 2001.

AP PHOTO

The Repair

The meniscus cartilage had dislocated to the front of the knee, causing the knee to lock. ACL reconstruction requires some movement in the knee. Because of this, the meniscus had to be repaired first.

1. Meniscus Surgery
While working on the meniscus, Dr. Steadman discovered the ACL tear was at the femur. He decided to perform the "Healing Response."

2. ACL Repairs Itself
Areas on the femur are selected where the ACL will reattach. This bone site is perforated arthroscopically with a microfracture awl to produce a "super clot" from the microfracture holes located at the femoral origin of the ACL.

3. The Outcome
There is no fixation or immobilization, and the repair relies completely on the surgically induced "super clot," which emerges from the bone marrow, to capture and reattach the torn ACL.

GLOBE STAFF GRAPHIC/DAN MCLAUGHLIN

(REPRINTED COURTESY OF THE BOSTON GLOBE)

BASIC SCIENCE RESEARCH: UNDERSTANDING JOINT DISEASE

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

THE PURPOSE OF OUR BASIC SCIENCE RESEARCH IS TO GAIN A BETTER UNDERSTANDING OF FACTORS THAT LEAD TO DEGENERATIVE JOINT DISEASE AND OSTEOARTHRITIS. OUR FOCUS IS TO DEVELOP NEW SURGICAL TECHNIQUES, REHABILITATIVE TREATMENTS, AND RELATED PROGRAMS THAT WILL HELP PREVENT THE DEVELOPMENT OF OR AMELIORATE DEGENERATIVE JOINT DISEASE.

As one prime example, Dr. Steadman has pioneered a surgical technique—microfracture—that, in 75 percent to 80 percent of patients treated, has provided pain relief and slowed or even stopped the progression of arthritis of the knee. Because of the microfracture procedure, patients with articular cartilage injuries have been able to return to physical activity and significantly delay or even avoid total joint replacement surgery. The procedure involves making small punctures in the bone that underlies the damaged cartilage. These small punctures, or "microfractures," provide access to the cells and healing factors contained in the bone marrow. These marrow elements are released and form a "superclot" that supports formation of new reparative cartilage. Our research has demonstrated that these various growth factors and other healing modulators significantly enhance the repair process.

Numerous physicians and scientists are helping study the changes that take place following microfracture and other related procedures. Our focus remains on gaining new knowledge and a better understanding of the source of repair cells and biochemical modulators of healing, as well as the interaction of these components. In concert with our collaborators, we are using advanced molecular biological, gene therapy, and biochemical techniques to control and enhance the healing processes.

These and similar studies are examples of work that will enable the Foundation to learn more about the inherent healing abilities of commonly injured tissues. These and other studies will define more accurately why certain tissues tend to degenerate and sustain injury. They also will aid us in determining why some patients heal more quickly and completely than others. Similarly, we seek to learn about the biochemical changes that take place in the tissues surrounding the joints as we age. For us, there is no task more exciting than to investigate novel and innovative approaches in Basic Science Research to accelerate the healing of tissue following injury and/or surgery.

We dedicated the majority of our time and resources in 2002 to a major research project, a brief description of which is provided below:

MICROFRACTURE COMBINED WITH GENE THERAPY TO ENHANCE CARTILAGE HEALING

The Foundation and Dr. Wayne McIlwraith, a world-renowned equine arthroscopic surgeon from Colorado State University, have continued to study healing of full-thickness articular cartilage defects in weight-bearing areas of joints. The horse has been used as the animal model because horses, like human athletes, frequently sustain partial or full-thickness defects to the articular cartilage. The horse, like humans, can also be treated arthroscopically. With this animal model, the lesions or injuries can be produced in weight-bearing areas of the joints via an arthroscopic approach. These lesions can then be treated in a manner virtually identical to the surgical technique developed by Dr. Steadman to treat human patients. Also, the thickness as well as the microscopic anatomy of a horse's articular cartilage is similar to that of humans. Finally, the surgical procedure performed on the horse, as in human patients, allows for retention of the subchondral plate while allowing various biochemical modulators of healing to ingress into the defect without making excessively large holes in the bone. One drawback to the equine model is the fact that it is not possible to keep the horse non-weight-bearing on the operated leg for several weeks as typically is done in human patients. Nonetheless, this model is truly a good test for articular cartilage repair techniques.

During 2002, we extensively revised and submitted a manuscript for publication in a scientific journal. That article now has been

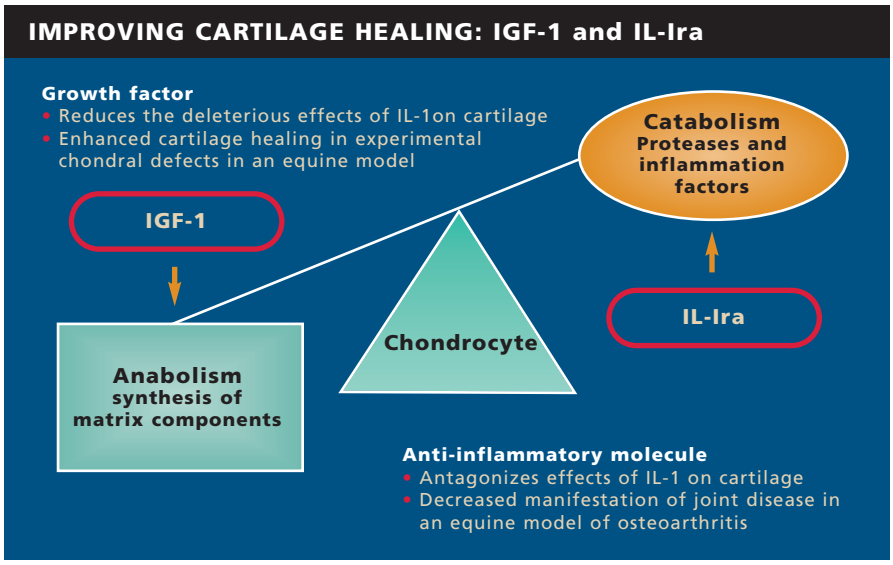


Figure 1 (Courtesy of Dr. Wayne McIlwraith)

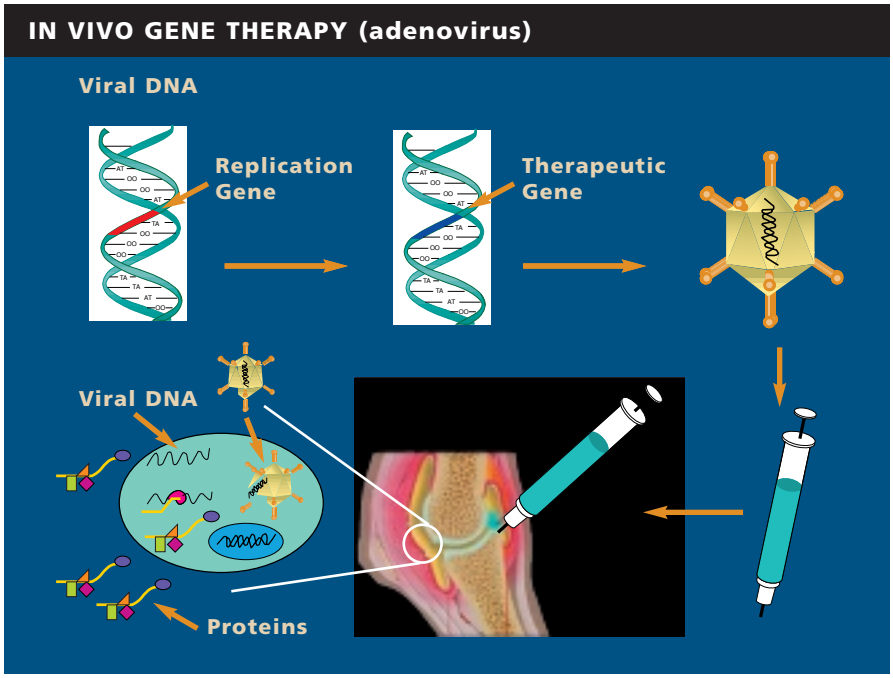


Figure 2 is a highly simplified diagram of how gene therapy works. One portion of the viral DNA, the replication gene, is "transfected" (viral gene is infected with the therapeutic gene) with the therapeutic gene. Once inside the joint, the virus then produces the two desired molecules, IGF-1 and IRAP. (Courtesy of Dr. Wayne McIlwraith)

published. The study, on which the article was based, investigated healing of large full-thickness articular cartilage defects during the first eight weeks with and without penetration of the subchondral bone using microfracture in an established equine model of cartilage healing. Chondral defects in the weight-bearing portion of the medial femoral condyle were made in each rear limb of the horse. One defect in each horse was microfractured while the contralateral leg served as the control. The expression of cartilage extracellular matrix components (Type I and Type II collagen and aggrecan) was evaluated using histologic techniques, reverse transcription coupled polymerase chain reaction, *in situ* hybridization, and immunohistochemistry. This study confirmed an increase in Type II collagen messenger RNA (mRNA) expression in repair tissue as early as six weeks after microfracture. However, while other matrix mRNA and protein levels changed in concentration and tissue location over the course of the study, no significant differences were noted in aggrecan levels in the microfractured defects.

In conclusion, while the microfracture techniques appear to significantly improve function, volume of repair tissue, and augment Type II collagen content, aggrecan content and proteoglycan production remain less than ideal. Therefore, methods to enhance the key matrix components, such as aggrecan and various proteoglycans, after microfracture may further improve repair tissue. This, in part, is one of the ongoing goals of our gene therapy work as noted below.

Our work with gene therapy to enhance tissue regeneration and chondral resurfacing moved forward rapidly and successfully in 2002. We are very encouraged by this work, and we believe that gene therapy may hold the key to future success in chondral resurfacing.

There are two reasons to undertake a gene therapy approach: (1) A perfect administration vehicle to deliver the healing proteins has not yet been developed and there are questions as to the timing of administration and how often growth factors need to be added, and (2) Dr. David D. Frisbie, assistant professor at the Colorado State University Equine Orthopaedic Research Center, and Dr. McIlwraith had excellent success with gene therapy following the delivery of the interleukin-1 receptor antagonist protein (IRAP) gene, with a single injection decreasing the amount of osteoarthritic change in horses. Dr. Alan Nixon, our collaborator at Cornell

University, has done *in vitro* work with insulin-like growth factor-1 (IGF-1) and the approach seems extremely promising in providing the metabolic regulation of the chondrocytes. In collaboration with Dr. Chris Evans at Harvard University, an expert in gene therapy for the treatment of musculoskeletal disease, we have taken a major step forward in the use of gene therapy to treat cartilage defects.

Our hypothesis for this study was that the combined anabolic properties of IGF-1 and the anti-inflammatory effects of IRAP would significantly improve the quality and quantity of the repair tissue found in full-thickness chondral defects treated with microfracture, thus improving clinical parameters of joint disease and reducing synovial joint inflammation. Our objectives were to determine the concentration and length of expression of viral-driven expression of IRAP and IGF-1 in synovial fluid of joints with full-thickness chondral defects treated with microfracture, and to determine the effects of these two molecules on synovial fluid in joints with full-thickness chondral defects treated with microfracture. Figure 1 shows how these two molecules can work in concert to improve cartilage healing.

The results of this study showed a significant increase in IRAP production driven by the therapeutic gene for a period of three weeks. Additionally, there was a significant increase in the production of IGF-1 for more than six weeks. The repair tissue in the defects of treated joints showed an increased amount of proteoglycans and Type II collagen content compared to untreated joints as demonstrated by biochemical and immunohistological analyses.

Consequently, we conclude that combination gene therapy using a growth factor (IGF-1), which stimulates matrix synthesis, and an anti-inflammatory molecule (IRAP), which blocks the effects of IL-1, significantly enhanced the quality of the repair tissue found in full-thickness chondral defects treated with microfracture. We are hopeful and encouraged that this successful study will bring us closer to the ability to modulate the production of long-lasting repair tissue in our ongoing efforts to treat articular cartilage defects.

This work continues in collaboration with Dr. Wayne McIlwraith and his staff at the Orthopaedic Research Center, Colorado State University. We gratefully acknowledge Dr. McIlwraith for his continuing cooperation.

Judy Collins: Shouldering On

"The following profile is based on an interview by Richard Needham. Mr. Needham is editor of "Skiing Heritage" magazine and the health newsletter "Arthritis Advisor."

For a pianist/guitarist with 37 albums, a bevy of top-10 hits and a host of Grammy nominations, a broken shoulder is not only no fun—it can be downright ruinous to a performer's career.

At the top of her profession four years ago (though most fans will argue that her career hasn't peaked yet), Judy Collins took a tumble while skiing. It happened at Vail, on Swingsville, and the result was a broken shoulder.

For Judy, it was a bummer. She and 18 other members of the Collins clan had gathered for a March weekend family reunion. "We had come in from all over the map," she says. "Normally I don't like to ski the first day because I've just flown in from who knows where and I try to spend the time organizing things, making dinner reservations, that sort of thing. But that afternoon I went for a run with my brothers and sisters.

"We had just started down Swingsville when my brother started joking about how famous people run into trees. Well, that did it. I took a dive on the trail's first pitch and was down for the count. Even though I couldn't stand up or sit down or move and could barely breathe, we pretty much concluded it was just a displaced shoulder.

"But no such luck. The next step was a visit to Dr. Sterett at Steadman-Hawkins."

The diagnosis: a fracture and dislocation of the right proximal humerus. The fix: a hemiarthroplasty of the right humerus—or a total right shoulder replacement.

Though the surgery was a success, Dr. Sterett cautioned Judy that she might see her shoulder recover only 60 percent to 70 percent. "But," says Judy today, "my shoulder is 110 percent." How come? "Four years," says Judy, "of disciplined rehab—and I was back on skis within a year."

Pretty remarkable for someone who claims she was never a jock. "I grew up playing the piano. In fact, that's all I did. I had absolutely no childhood...but I'm making up for it now."

Born and raised in Colorado, and now living with husband Louis Nelson in New York City, Judy still pines for the outdoors—hiking, for the most part, and skiing. She has performed as a musician, singer and songwriter her entire life, first as a classical pianist at age 10 (she studied under the famed conductor Antonia Brico, later producing a documentary on Brico's life that earned her an Academy Award nomination) and later, at 16, as a guitarist and singer as she discovered and embraced the traditional songs of the folk revival of the Sixties.

Playing at the Village Gate in New York in 1961, she was discovered by Elektra Records. Thus began a 35-year involvement with the company. But Judy's eclectic nature soon blossomed into a broad mixture of songs, a characteristic that has stamped her albums ever since.

She now has her own record label, Wildflower, and a new song—"Kingdom Come," a tribute to the New York City firemen who perished on September 11, 2001.

What impressed Judy most during her experience at Steadman-Hawkins were the people. "They were the best—so kind and so professional." It's one reason for her frequent trips to Vail to perform in fund-raisers for the Foundation. "I'm particularly interested in the Foundation's research program. I've learned so much, so many things about women in sports—about the links to osteoporosis, about how to stay fit—that I never knew before."

As for her career, it continues to skyrocket. As one music critic recently put it, "Judy continues, with music of hope and healing, to light up a world that needs music that matters and speaks to the heart."

Nice words. But what matters as much to Judy is skiing with her family, and especially with her granddaughter. "She's 15," says Judy, "and she's one hot skier!"

JUDY COLLINS

I'm particularly interested in the Foundation's research program. I've learned so much, so many things about women in sports.

JUDY COLLINS

CLINICAL RESEARCH: "OUTCOMES" AND "PROCESS" RESEARCH

THE PURPOSE OF CLINICAL OUTCOMES RESEARCH IS TO ASSESS THE EFFECTIVENESS OF HEALTH CARE PRACTICES AND INTERVENTIONS FROM THE PERSPECTIVE OF THOSE WHO RECEIVE THE CARE AND THOSE WHO PROVIDE IT. DUE TO CHANGING TECHNOLOGY, PATIENTS HAVE BECOME MORE EDUCATED CONSUMERS, AND THIS HAS DRIVEN PATIENT-CENTERED OUTCOMES TO CENTER STAGE AS THE PRIMARY MEANS OF MEASURING THE EFFECTIVENESS OF HEALTH CARE.

Karen K. Briggs, Director; Marilee Horan, Research Associate; Elizabeth Barry, Research Associate; Tyler Richardson, Intern; David Wing, Intern

Patient-derived clinical research focuses on the impact interventions have on patient status, which may include symptoms, function, quality of life, and satisfaction. New treatments often make claims for improved outcomes. For these claims to be valid, treatments must be objectively evaluated by long-term outcomes. The publication of outcomes research, which is based on all knee and shoulder patients who have undergone treatment at the Steadman-Hawkins Clinic and stored in a database, will allow patients to evaluate results and participate in decision-making on the type of care they desire. The goal of this research is to carry out outcomes research that will aid both physicians and patients in making better-informed decisions regarding medical treatment.

The future of Clinical Research will be based on learning from the patient. Our research will focus on predictors of disability, predictors of satisfaction, patient expectations, and patient outcomes from surgical procedures.

PATIENT SATISFACTION AFTER ROTATOR CUFF SURGERY

From our clinical research database, we were able to identify elements after rotator cuff surgery that correlated with patient satisfaction. Some surgical and objective variables were associated with satisfaction, particularly those related to size of the rotator cuff tear, involvement of the subscapularis, range of motion of the shoulder, impingement, and the acromioclavicular joint (the joint connecting the acromion and clavicle) symptoms. However, subjective variables played an even greater part in patient satisfaction. There was a significant decrease in satisfaction for patients with continued pain, functional deficit, and work disability. While relief of pain is often the primary goal of surgical treatment, our data suggest that, in addition to pain, function and the ability to work is important to the patient as well.

This study, authored by James D. O'Holleran, M.D.; Mininder S. Kocher, M.D.; Marilee Horan, B.S.; and Richard J. Hawkins, M.D., was presented in 2002 at two national meetings. The paper will be sent to the *Journal of Bone and Joint Surgery* for consideration.

PREDICTORS OF SATISFACTION WITH OUTCOME AFTER ANTERIOR SHOULDER SURGERY

A study was completed using the clinical research database to determine predictors of patient satisfaction with outcome after anterior shoulder stabilization. We looked at the questionnaires of 200 patients who were two years out after surgery to determine satisfaction with outcome. Answers were graded on a 1-10 scale, with 10 being highly satisfied, and an analysis was performed to identify determinants of satisfaction. Overall, patients reported an average satisfaction outcome score of 9. Prior surgery or type of surgery performed were not predictors of patient satisfaction. While specific surgical and objective variables were associated with satisfaction, subjective variables of symptoms and function had the strongest associations with satisfaction. An analysis showed that if patients continued to feel pain and instability, they were more likely to be dissatisfied with surgical results. Patients with a re-injury or experiencing pain at work and during recreational activities were also not satisfied with their surgery.

This study was authored by James D. O'Holleran, M.D.; Mininder S. Kocher, M.D.; Marilee Horan, B.S.; and Richard J. Hawkins, M.D.

PATIENT SATISFACTION AFTER SUPERIOR LABRAL ANTERIOR POSTERIOR (SLAP) LESION SURGERY

Another patient satisfaction study, begun in 2002, looked at factors associated with superior labrum surgical intervention that correlated with satisfaction. The glenoid labrum is one of the stabilizing and load-sharing structures in the shoulder and the point where other capsule ligaments attach. SLAP lesions are superior tears in the glenoid labrum. Some injuries are traumatic enough to cause the labrum to peel back in the area where the biceps is anchored to the shoulder joint. SLAP lesions are commonly found in throwers and overhead laborers. Complete demographic, surgical, subjective, and objective data were collected on 151 patients.

On initial analysis, lower satisfaction scores were associated with patients with workers' compensation status, a re-injury account or a prior shoulder surgery. Patients with abnormal articular cartilage on the glenoid and a large tear of the biceps tendon also tended to be less satisfied. Patients who did not experience pain or tenderness in the acromioclavicular joint but lacked some passive forward elevation were more satisfied. The American Shoulder and Elbow Society (ASES) Shoulder Score, which measures pain and function, correlated highly with patient satisfaction. Some independent predictors of satisfaction were prior surgery, workers' compensation status and overall ASES score. This study will be completed in 2003.

ACCORDING TO THE CENTERS FOR DISEASE CONTROL, ARTHRITIS AND CHRONIC JOINT SYMPTOMS CURRENTLY AFFECT NEARLY 70 MILLION PEOPLE, OR ONE OF EVERY THREE ADULTS IN THE U.S.

PATIENT SATISFACTION AFTER HIGH TIBIAL OSTEOTOMY

High tibial osteotomy (HTO) is a procedure used for treatment of varus malalignment (bow-leggedness) of the knee. Malalignment in the knee is a condition that leads to premature deterioration of the cartilage and meniscus of the knee joint. This, in turn, can develop into arthritis. For the past seven years, Dr. William I. Sterett has been performing this procedure on patients who are young and active and would like to postpone total knee replacements for as long as possible.

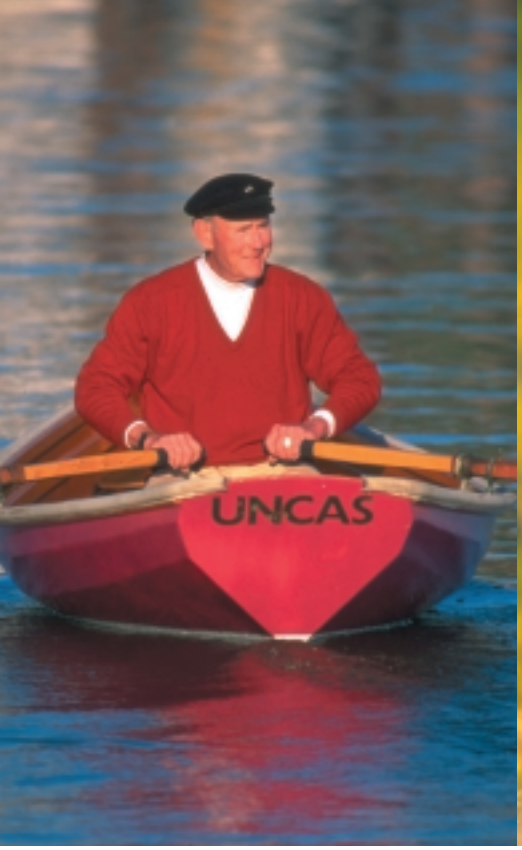
In 2002, we completed a study that looked at patient satisfaction and functional outcome following HTO on the medial side of the proximal tibia. The study included 61 patients with a minimum of two-year follow-up. Thirty patients were treated with an external fixator, while the other 31 patients were treated with a plate fixation. We found that HTO in the active patient with varus degenerative joint disease produces high patient satisfaction and improved functional outcomes. We also found that satisfaction and outcome were independent of age, gender, fixation technique, or magnitude of correction. We concluded that medial opening wedge HTO is an effective surgical option for treatment of the degenerative varus knee in an active patient.

This study was authored by Bruce Miller, M.D.; Tom Joseph, M.D., Elizabeth Barry; Valerie Rich; and William I. Sterett, M.D. It will be presented at the 2003 Arthroscopy Association of North America Annual Meeting.

Dr. Steadman.

As health care becomes more patient-driven, assessing patient satisfaction is a major objective of our data collection. Our objective is to evaluate patient satisfaction, and to identify parameters that are related to such satisfaction. With determinants of patient satisfaction from these studies, we can identify the elements that are most important to patients following surgery.

Varus Malalignment.



Medial opening wedge high tibial osteotomy.

OSTEOARTHRITIS

By the year 2020, arthritis will affect more than 18 percent of all people in the United States. According to the Centers for Disease Control, arthritis and chronic joint symptoms currently affect nearly 70 million people, or one of every three adults in the United States. This makes arthritis one of the most prevalent diseases in the United States, and the number continues to increase as the population ages. Osteoarthritis (OA) is among the most frequent and symptomatic medical problems for middle-aged and older people. The costs of arthritis are great. The leading cause of disability in the United States, arthritis is the source of at least 44 million visits to health-care providers, and the estimated medical cost for people with arthritis was $16 billion in 1997.

MICROFRACTURE OF THE DEGENERATIVE KNEE

Surgical management of the arthritic knee in an active patient presents a challenge to the orthopaedic surgeon. Many surgical procedures have been developed to treat articular cartilage lesions of the knee, but few have been shown to be successful in the degenerative knee. Total knee arthroplasty demonstrates predictably favorable results in the treatment of the arthritic knee, but many patients wish to put off a knee replacement in order to maintain a high level of athletic activity. In 2002, we completed a study that investigated the outcome of the microfracture technique when applied to degenerative articular cartilage lesions of the knee. Our study included patients over the age of 40 who had full-thickness degenerative lesions of the knee and underwent microfracture. The study showed that in these patients, averaging 2.6 years following surgery, symptoms and function had improved. Patient activity level had increased and the patients were highly satisfied. We hope our findings will help establish future guidelines and expectations in the treatment of patients with osteoarthritis of the knee.

HIGH TIBIAL OSTEOTOMY

Medial opening wedge high tibial osteotomy (HTO) has gained popularity as a means of decreasing pain and correcting malalignment in young and active patients with medial compartment arthrosis (degenerative disease of the joint) and varus malalignment. In 2002, we completed several studies on this procedure.

COMPLICATION RATES FOLLOWING OPENING WEDGE HIGH TIBIAL OSTEOTOMY

The purpose of this study was to evaluate complication rates following HTO in active patients using either the distraction technique or Puddu plate. Complications were classified as either major (requiring repeat hospitalization or surgery), or minor (not requiring repeat hospitalization). The overall complication rate utilizing both techniques was similar. Sixty-seven percent of patients who underwent an HTO with the distraction technique experienced complications, whereas 65 percent of those in the Puddu plate group experienced complications.

We have previously reported a high improvement in functional outcomes despite a high complication rate. Furthermore, when examining these complications more closely, it appears that the large majority of the distraction technique group experienced minor complications, while the majority of the Puddu plate group experienced major complications. We conclude that the Puddu system may be in need of design modifications to decrease the major complication rate, especially in cases requiring further surgery.

This study, authored by William I. Sterett, M.D.; Valerie Rich; and Elizabeth Barry, will be presented at the 2003 American Orthopaedic Society for Sports Medicine Annual Meeting.

POSTERIOR TIBIAL SLOPE FOLLOWING MEDIAL OPENING WEDGE HIGH TIBIAL OSTEOTOMY

Medial opening wedge HTO is a procedure for the treatment of varus malalignment of the knee. Because of the triangular cross-sectional anatomy of the tibia, this procedure may produce biplanar correction. The purpose of this study was to determine whether the posterior slope of the tibia is changed by performing an HTO. In addition, if the posterior slope is changed, does this change have any effect on range of motion or functional outcome?

We found that by performing an HTO, the posterior slope of the tibia is significantly increased. We then focused on whether this change affects the range of motion of the knee or the functional outcome of the patient. We concluded that an increase in posterior slope of the tibia did not have a negative effect on range of motion or changes in functional outcome.

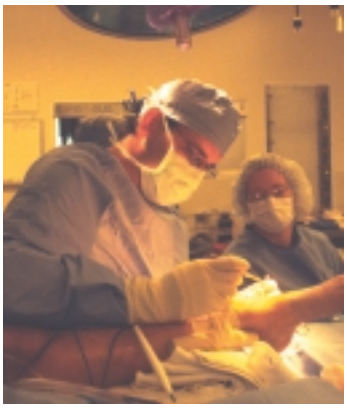
This study, authored by Tom Joseph, M.D.; Bruce Miller, M.D.; Valerie Rich; Elizabeth Barry; and William I. Sterett, M.D., will be presented at the 2003 American Academy of Orthropaedic Surgeons Annual Meeting.

CHONDRAL LESIONS TREATED WITH MICROFRACTURE AND MEDIAL OPENING WEDGE HTO

Between 1995 and 2002, Dr. Sterett and Dr. Steadman performed microfracture combined with a medial opening wedge high tibial osteotomy on more than 150 knees diagnosed with malalignment and medial compartment degenerative joint disease. The purpose of this study was to assess the ability of the combined procedure to regenerate articular cartilage in the knee. This assessment could only be made in patients undergoing subsequent "second-look" arthroscopy. During this second procedure, the doctors assessed the percentage of coverage of the original chondral defect(s) with new, regenerate cartilage. The study found that, on average, 82 percent of the original defects were covered with regenerate cartilage. The longer the period of time between the original procedure and the second-look arthroscopy, the more chondral coverage the knee had, and those patients with more coverage had better post-operative function. This study confirmed that chondral resurfacing is possible in the degenerative knee.

GLENOHUMERAL OSTEOARTHRITIS

Osteoarthritis of the glenohumeral joint is a common cause of shoulder pain. It can result in restricted range of motion and loss of function. In the osteoarthritic shoulder the articular surface anatomy may be damaged, leading to pain and loss of function. Arthritis in the shoulder can develop following trauma, shoulder surgery, or an inflammatory joint condition.



The Relative Risk of Glenohumeral Arthritis in Patients with Shoulder Instability

In a previous study, we showed that the prevalence of osteoarthritis is low in patients with shoulder instability. However, we did find a significant association between age and arthritis and between time from injury and arthritis. In this study, the longer the patient was unstable, the greater was the proportion of arthritis. In 2002, a study was completed to estimate the risk of developing osteoarthritis in patients with shoulder instability compared to a control group to determine what other factors may contribute to this risk.

For this study, data were collected in a database from 1993 to 2000. The control group consisted of 83 patients and the instability group included 422 patients who were diagnosed with shoulder instability. The overall prevalence of arthritis in the instability group (15 percent) was significantly higher than the prevalence in the control group (5 percent). Compared to our control group, patients with instability had a three times greater risk of arthritis. In patients over 35 years of age, this risk increased to 4.6 times. In summary, patients with shoulder instability are at increased risk for the development of shoulder arthritis. The risk increases as the patient ages, when a Bankart lesion is present, and as the duration of symptoms increases. A Bankart lesion is a tear to the anterior (front) of the shoulder.

Dr. Hawkins.

This study was authored by Michele Cameron, M.D.; Karen Briggs, M.B.A., M.P.H.; Marilee Horan; and Richard J. Hawkins, M.D. It will be presented at the 2003 American Academy of Orthopaedic Surgeons and 2003 International Society of Arthroscopy, Knee Surgery and Sports Medicine Annual Meeting, where it has been nominated for the Caspari Award for best shoulder study.

Glenohumeral Arthritis and Long-Standing Anterior Instability of the Shoulder

The purpose of this study was to determine whether an association exists between the degree of anterior shoulder instability and the development of glenohumeral osteoarthrosis. We hypothesized that patients with longer-standing symptoms and more instability would have increased prevalence of arthritis.

Data from 201 patients with anterior instability were analyzed. We found an association between increasing grades of anterior instability and the development of arthritis. Patients with grade III translation or severe instability were at highest risk for the development of arthritis. This risk increased with the presence of a Bankart lesion and age of over 35. A Bankart lesion is a tear to the anterior (front) of the shoulder. This study found an association between the amount of humeral head translation and the presence of arthritis in joints of patients with anterior shoulder instability. Shoulder instability is a potential contributor to the development of shoulder osteoarthritis.

This study is authored by Michele Cameron, M.D.; Karen Briggs, M.B.A., M.P.H; Marilee Horan; and Richard J. Hawkins, M.D. It will be presented at the 2003 American Orthopaedic Society for Sports Medicine Annual Meeting.

DETERMINANTS OF PATIENT SATISFACTION FOLLOWING SHOULDER ARTHROPLASTY

Total shoulder replacement (in which both the humeral head and the glenoid are replaced) and hemi-shoulder replacement (in which either the humeral head or the glenoid are replaced) has become the standard treatment for advanced osteoarthritis of the glenohumeral joint.

The objective of this study was to identify determinants of patient satisfaction with outcome following total and hemi-shoulder arthroplasty. Demographic variables, such as age and gender, did not make a difference in patient satisfaction. Some specific surgical variables were associated with satisfaction, including those related to rotator cuff tears of the subscapularis and infraspinatus tendons. Analysis of subjective variables identified pain with activities and work, position of arm without pain, and use of anti-inflammatory medication as predictors of patient satisfaction. Shoulder arthroplasty provides relief of pain and improvement of function in the upper extremity of patients with degenerative osteoarthritis. This study will be completed in 2003.

INJURY TREATMENT TO MAINTAIN FUNCTION AND ACTIVITY

Microfracture

Full-thickness chondral defects in the knee are common after traumatic injury. They rarely heal spontaneously, and most patients eventually develop degenerative changes that can be debilitating.

To treat full-thickness chondral defects, the ideal technique would be relatively simple to perform, have a low patient morbidity, be cost-effective, and have a high long-term success rate without jeopardizing the ability to perform future procedures. More than 20 years ago, Dr. Steadman began performing the microfracture technique for the treatment

of cartilage defects. The technique was developed to enhance chondral resurfacing by providing a suitable environment for new tissue formation and taking advantage of the body's own healing potential.

Microfracture to Treat Traumatic Chondral Defects

Over the past eight years, several studies have been published on functional outcomes. These studies suggested improvement over the preoperative status. In 2002, a study that looked at case series of patients with long-term follow-up was accepted for publication in *Arthroscopy*. This study included follow-up on patients an average of 11 years following microfracture, with the longest follow-up being 17 years.

The study found that arthroscopically performed debridement and microfracture for isolated full-thickness chondral defects in patients under 45 years of age led to significant improvement in function and symptoms. This improvement was maintained a minimum of seven years and up to final follow-up.

The study, authored by J. Richard Steadman, M.D.; Karen Briggs, M.B.A., M.P.H.; Juan J. Rodrigo, M.D.; Mininder S. Kocher, M.D.; Thomas Gill, M.D.; and William G. Rodkey, D.V.M., will be published in early 2003.

Microfracture in NFL

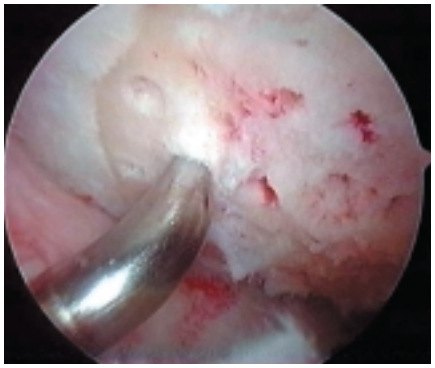
Another microfracture study was completed and accepted for publication in 2002. In it, we reviewed the results of microfracture in National Football League (NFL) players. Twenty-five active NFL players underwent the microfracture procedure to treat full-thickness chondral lesions between 1986 and 1997. Symptoms, activity levels, and function improved. Nineteen players (76 percent) returned to football the season following microfracture. Six players retired for various reasons and did not return to play. Those who returned to play averaged 4.6 seasons of participation and 56.8 games after microfracture. These results in high-demand NFL players are encouraging. The microfracture technique is safe, effective, and appears to markedly improve symptoms, function, and activity levels in NFL players. This study, authored by J. Richard Steadman, M.D.; Bruce Miller, M.D.; Spero Karas, M.D.; Ted Schlegel, M.D.; Karen Briggs, M.B.A. M.P.H.; and Richard J. Hawkins, M.D.; will be published in 2003 in the *American Journal of Knee Surgery*.

Heat Probe

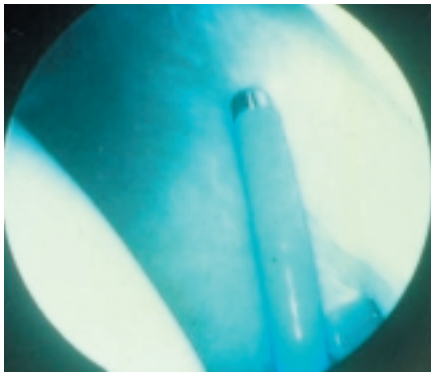
Instability of the shoulder is often a painful condition characterized by repeated dislocation or subluxation of the glenohumeral joint. Instability occurs when the ligaments become stretched or torn and the humeral head cannot be constrained in the glenoid socket. A number of arthroscopic techniques have been developed to reduce the capsular volume to treat shoulder instability. Basic science studies have shown that capsular shrinkage can be thermally induced and therefore aid in the treatment of shoulder instability.

In 2002, an abstract on thermal capsulorrhaphy, authored by Sumant Krishnan, M.D.; Richard J. Hawkins, M.D.; Spero Karas, M.D.; Marilee Horan; and Thomas Noonan, M.D., was voted best abstract at the Amercian Orthopaedic Society for Sports Medicine Annual Meeting. This resulted in the opportunity to present the research in more detail at the Annual Meeting of the American Association of Orthopaedic Surgeons. The award included a highly visible cubical in which we presented our research with posters and incorporated an audiovisual element in the presentation. This exhibit highlighted the electrothermal device known as the Heat Probe.

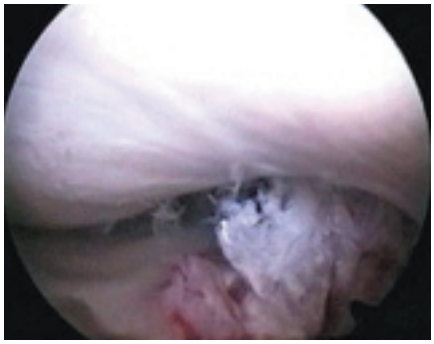
Basic science studies have shown that capsular shrinkage can be thermally induced and may therefore aid in the treatment of shoulder instability. In early 1997, Dr. Hawkins began using the latest generation of thermal shrinking devices, the Heat Probe.



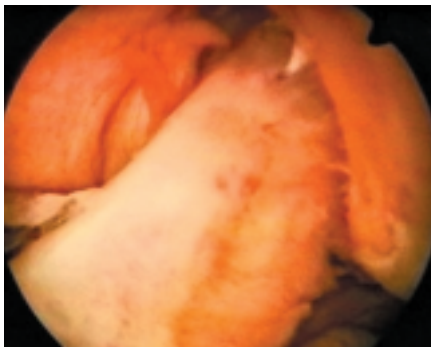
Microfracture technique to repair full-thickness chondral defects.



Heat probe is used to treat shoulder instability by shrinking capsular tissue.



The anterior cruciate ligament can tear in many different locations.



A second look at healed ACL eight weeks following the healing response repair procedure.

After following the progress of the first 100 patients that were treated with the Heat Probe, initial data revealed a higher than expected instability recurrence rate of 10 percent to 50 percent, depending on the type of instability treated. Previously published arthroscopic failure (recurrent instability) rates for anterior instability approached 50 percent, with recent open anterior failure rates ranging from 0 to 20 percent. Responding to the data, we modified our surgical technique to include capsular plication and rotator interval closure to improve our surgical outcomes. We also reevaluated the length of postoperative immobilization and rehabilitation to compromise between stability and restoration of function. We remain optimistic concerning the use of thermal shrinkage to aid in restoring normal capsular tension in the treatment of instability. Thermal treatment of the capsule is an effective adjunct but may not replace suture repairs (either open or arthroscopic). We will continue to monitor the progress of these patients and hope to validate the belief that these new adjuncts will improve their surgical outcomes.

AT AN AVERAGE FOLLOW-UP OF 41 MONTHS, 92 PERCENT OF THE PATIENTS EXPERIENCED NO OR MINIMAL PAIN, 95 PERCENT OF THE PATIENTS EXPERIENCED NO GIVING WAY, AND 94 PERCENT CONSIDERED THEIR KNEE FUNCTION TO BE NORMAL TO NEARLY NORMAL

HEALING RESPONSE

When injured, the anterior cruciate ligament can tear in many different locations with many different types of tears. Mid-substance tears historically have not done well with routine repairs—i.e., placing sutures on each end of the ligament—and thus a reconstruction is warranted to reconstitute the integrity of the ruptured ligament. It is believed that proximal tears heal better than mid-substance tears because of increased blood supply and proximity to the femur. In some proximal tears, half of the cruciate ligament is still attached, or a small strand of ligament is still attached, or the synovium overlying the cruciate is still attached. Because of this, the ligament itself remains in close proximity to its insertion on the femur, yet it still is functionally incompetent.

Because of the continued attachment proximally, Dr. Steadman developed the "healing response" technique to promote repair of proximal ACL tears. Microfracture holes are made into the cortical bone at the origin of the disrupted ligament and into the ligament itself. The surgically induced marrow clot captures the ends of the ligament and provides healing proteins and regenerative cells and, resultingly, an enriched environment for tissue regeneration. The ligament ends reunite without other fixation.

In 2002, we continued our project of long-term follow-up on 1,500 patients who have undergone the healing response procedure. In 2002, a study that examined the outcomes of the healing response technique in patients 40 years and older was presented as a poster at the American Academy of Orthopedic Surgeons Annual Meeting and at the 2002 Arthroscopy Association of North America Annual Meeting. In the study, 198 patients with an average age of 50 years (range 40-74 years) were followed. The average time from injury to surgery was 13 days. Five patients (2.5 percent) suffered a re-injury and underwent reconstruction. At an average follow-up of 41 months, 92 percent of the patients experienced no or minimal pain, 95 percent of the patients experienced no giving way, and 94 percent considered their knee function to be normal to nearly normal. Patients were highly satisfied and for those who returned for clinical follow-up, their KT-1000 Manual Maximum Distance (a measure of knee-joint laxity)

improved from an average of 5.0 mm to 1.9 mm. The study concluded that the healing response technique restored ligament stability and knee function in patients over 40 years of age with torn proximal ACLs.

Another study, entitled "A Minimally Invasive Technique (Healing Response) to Treat Proximal ACL Injuries in the Skeletally Immature Patient," reviewed 13 adolescent patients with a proximally torn ACL who underwent the healing response procedure. Three patients had a re-injury episode and underwent an ACL reconstruction at an average of 42 months following the healing response. Of the remaining patients, none experienced pain or giving way and all considered their knee function normal. The study concluded that based on this short-term study, the healing response procedure restored stability and knee function in this patient population. Patients were satisfied with the procedure and returned to a high level of sports and activities.

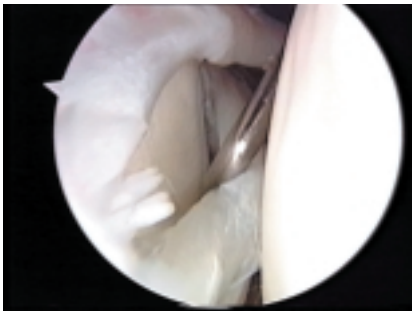
PATIENT ACTIVITY GOALS

The goal of orthopedic surgery is often to help patients return to their desired level of activity. The Tegner scale is a subjective assessment of activity ability, ranging from level 0 (sick leave due to knee problems) to level 10 (competitive sports, including soccer, football and rugby). Often before surgery, patients want to reach a higher level of activity, defined as the Tegner goal. The purpose of this study was to determine whether the patient's goal had an effect on the patient's satisfaction following surgery.

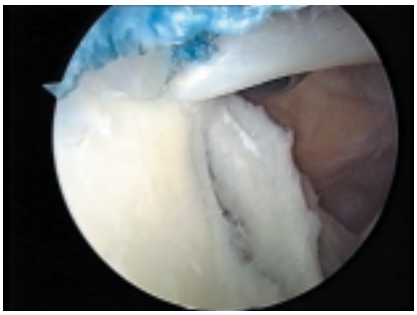
Thirty patients were assessed pre-operatively and each was tracked post-operatively for an average of 13 months. Pre-operatively, patients reported an average Tegner level of 3, with a Tegner goal of 7. At post-operative follow-up, patients reported a current Tegner level of 5, two levels off their goal, with an improvement of two levels. In order to examine the role of the Tegner goal on patient satisfaction, 30 patients were divided into two groups: a "positive" group that had come within two levels of their goals upon follow-up, and a "negative" group that had not. Initially, the positive group had a lower Tegner score, along with a lower goal, but were able to come within half a level of their goal at follow-up. The negative group actually decreased their Tegner level post-operatively. Of interest, both groups had equivalent satisfaction scores, signifying that attaining one's Tegner goal was not a major determinant of patient satisfaction.

To observe factors that might differentiate between satisfied and unsatisfied patients, the group was again divided into two groups—a "positive satisfaction" group with a satisfaction of 7 or greater, and a "negative satisfaction" group. Patients with higher satisfaction scores had greater improvement with Tegner scores and higher post-op Tegner scores.

Finally, in comparing patients with degenerative joint disease (DJD) vs. ACL injuries, ACL patients had a near-zero initial Tegner level, with higher Tegner goals than the DJD group. At follow-up, ACL patients were able to come within half a level of their goal, vs. two levels for DJD, and had significantly higher satisfaction.



Superior labral tear.



Sutured superior labral tear.

While many factors probably contribute to patient satisfaction (including time after surgery, severity of original injury, rehabilitation program, etc.), this study showed that the ability of patients to reach their Tegner goal may not have a great effect on patient satisfaction. This study, when more data have been collected, will be completed in 2003.

Can the Impingement Test Predict Outcome After Arthroscopic Subacromial Decompression?

The impingement test, placement of a local anesthetic in the subacromial bursa, is considered a useful tool in diagnosing subacromial impingement syndrome, which occurs when there is contact between the rotator cuff and the overlying coracoacromial arch. A study was undertaken to examine the predictive value of the impingement test with respect to outcome after arthroscopic subacromial decompression. The study found that there was a significant association between successful outcomes and positive impingement test results. Patients with a positive impingement test were more likely to have a positive outcome at 12 months compared to patients with a negative test. The study concluded that the impingement test is a useful component in the examination of patients who have been diagnosed with subacromial impingement. Our evidence indicates that the test results correlate with the outcome of surgery. Therefore, we use the test results as one tool to predict outcome after arthroscopic subacromial decompression.

This study, authored by Scott D. Mair, M.D.; Randy Viola, M.D.; Thomas Gill, M.D.; Karen Briggs, M.B.A., M.P.H.; and Richard J. Hawkins, M.D., was accepted for publication in the *Journal of Shoulder and Elbow Surgery*.

Patient Satisfaction and Outcome Following ACL Allograft Reconstruction

Although autograft ACL reconstruction, which utilizes the patient's own tissue, is the preferred procedure in the Steadman-Hawkins Clinic, allograft ACL reconstruction, which utilizes tissue taken from a cadaver, is employed when the autograft procedure is inadvisable. This often occurs in patients requiring a revision of a previous ACL reconstruction, as well as in patients with patellar femoral problems. The purpose of this study was to report the post-operative satisfaction and clinical outcome of patients who have undergone allograft ACL reconstruction. The study group included patients for whom the allograft procedure was the first or primary ACL reconstruction, as well as those for whom the allograft reconstruction was a revision procedure. All patients in this study received fresh-frozen patellar tendon allografts. Surveyed two years following their allograft surgery, patients reported an average satisfaction score of 8 (10 = most satisfied) and an average functional score (Lysholm) of 80 out of 100. These results are satisfactory considering that all patients had other knee problems, or had undergone previous ACL surgery, before undergoing the allograft procedure. In line with previous studies, our statistical analysis found that post-operative patient activity level and patient-reported symptoms were the strongest predictors of patient satisfaction following surgery.

SLAP Lesions of the Shoulder

Little is known about the clinical factors and other pathologies associated with high-level (Grade III or IV) tears of the superior glenoid labrum of the shoulder—also known as "SLAP lesions"—due to the rarity of such tears. Grade III lesions are defined as bucket-handle tears with the biceps anchor intact; Grade IV lesions can be recognized by a vertical tear of the superior labrum extending into the biceps. As a result of our extensive database, we were able to identify 56 patients with Grade III or Grade IV SLAP

tears and describe clinical factors that might assist a physician in identifying a high-level SLAP lesion.

Based on our examination, most patients had a traumatic injury resulting in the tear, often involving sports and sports-related falls (skiing, football, etc.). Despite the severity of an injury that would elicit such a tear, patients waited an average of two and a half years before having surgery. However, there was a difference between the groups: patients with type IV tears waited an average of 3.75 years as opposed to only 1.75 years for type III tears. Factors that eventually led the patients to request medical attention were pain and instability. Patients scored an average of 68 out of 100 in the American Shoulder and Elbow Surgeons (ASES) Standardized Shoulder Assessment test—a subjective assessment of a patient's shoulder disability. Most patients reported significant pain associated with their work and recreational activities. A high sense of instability in the shoulder joint was reported in many patients. Physicians at the time of surgery discovered that patients had a high degree of instability, often in more than one direction, while under anesthesia.

We also examined surgical findings to uncover other pathologies of the shoulder that often occur with high-level SLAP lesions. Bankart lesions were often found, as was an abnormal labrum outside the site of the SLAP tear. Several patients had damage in the acromioclavicular joint (the joint connecting the acromion and clavicle). Articular cartilage remained normal in most patients. Few patients had tears of other tendons and muscles in the shoulder.

An examination of differences between the two groups was made. The only significant difference between patients with type III SLAP tears and patients with type IV SLAP tears was the number of injuries that resulted from sports. Type IV tear patients had a higher percentage of injuries resulting from sports than did type III patients. In fact, all type IV lesions in patients 40 years or younger resulted from a sports-related injury. Type IV tears also had a higher percentage of associated Bankart lesions, and a higher percentage of abnormal biceps pathology compared to type III tears.

With this examination, it is our hope that physicians can obtain a better knowledge of what to expect when diagnosing these high-level tears of the superior labrum. This study will be completed in 2003.

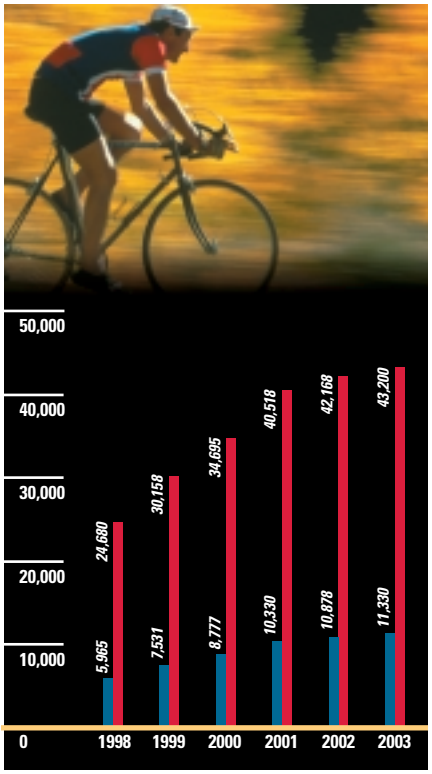
CLINICAL DATABASE

The purpose of the Steadman-Hawkins Clinical Research Database is to gather outcome data on patients undergoing treatment for orthopaedic injuries in an effort to document long-term outcomes. The aim of the project is to document outcomes following orthopaedic procedures and educate patients on outcomes to help them make a more informed decision. Data are collected on all knee and shoulder patients and stored in our database. This permits us to perform an outcome analysis on many different procedures over a period of many years.

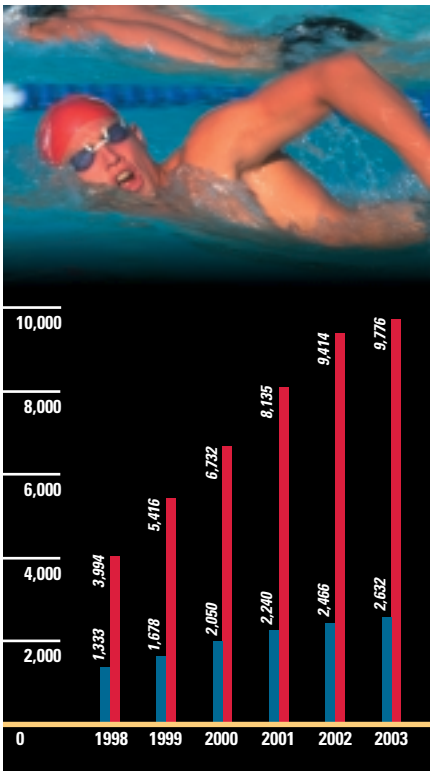
Studies at the Steadman◆Hawkins Sports Medicine Foundation are case series involving multiple subjects reported with a condition and/or intervention with or without a comparison group. Data are collected on all consenting patients who undergo shoulder or knee surgery. These studies suggest a clinical course and the response to the intervention. The advantage of this type of study is that data can be collected on a large number of patients. Also, the ethical dilemma of a control group is avoided. The disadvantages include a bias in patient selection and no randomized patient selection.

Patient participation is voluntary and patient information is stored anonymously. In 2002, we received Internal Review Board approval from the Vail Valley Medical Center's IRB for the protocol entitled "Collection of patient data to monitor outcomes following treatment for orthopaedic injuries."

KNEE DATABASE



SHOULDER DATABASE



BIOMECHANICS RESEARCH LABORATORY

Michael R. Torry, Ph.D., Director; Takashi Yanagawa, M.A., Research Fellowship/Internship; Michael J. Decker, M.S., Staff Scientist; Michelle Sabick, Ph.D., Senior Staff Scientist; Kevin Shelburne, Ph.D., Senior Staff Scientist

Mission and Goals

THE MISSION OF THE BIOMECHANICS RESEARCH LABORATORY'S (BRL) IS TO FURTHER THE SCIENTIFIC UNDERSTANDING OF BASIC BIOLOGICAL PROCESSES AND TO DEVELOP INNOVATIVE APPROACHES FOR THE UNDERSTANDING, PREVENTION, DIAGNOSIS, AND TREATMENT OF MUSCULOSKELETAL DISEASE.

BIOMECHANICS: SEARCHING FOR THE HOW AND WHY

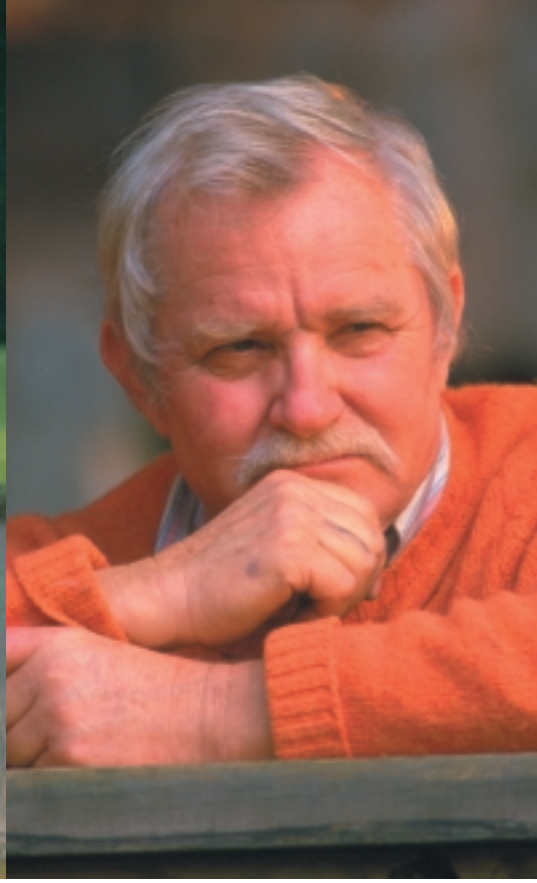
The Foundation's Biomechanics Research Laboratory is a multidisciplinary laboratory in which the principles of mathematics and engineering are applied to solving complex problems in orthopaedic medicine. A main objective of the BRL is to explain how and why injuries, treatments, surgeries and various therapies work for some individuals and not for others.

The output for the BRL for the year 2002 has been exemplar of this group's work ethic over the past six years with 15 refereed abstracts presented at four national and international conferences. The group has also produced eight original full-length research papers (four currently in review, four accepted for publication). Notwithstanding, the quantity of the work is backed by substantial quality. Most notably, Kevin Shelburne, Ph.D., was awarded the *Journal of Biomechanics* Research Award, one of biomechanics' most prestigious international awards, at the Fourth World Congress of Biomechanics held in Calgary, Alberta. "Each year our research gets stronger and stronger, and we are receiving recognition from our peers for the quality of the work we do," says Dr. Mike Torry. Some of the research that the BRL has begun or completed in the year 2002 is described below.

DETERMINING KNEE COMPARTMENT LOADS

Many individuals suffer from osteoarthritis of the knee. The degeneration of the knee joint often becomes more painful during activities of daily living such as walking or hiking. Until recently, it was not known what type of mechanical loads are distributed throughout the knee. Dr. Marcus Pandy, professor of Biomedical Engineering, and Dr. Kevin Shelburne, senior staff scientist, developed computer simulations to predict loads inside the knee during walking. These simulations utilized models of the knee and lower extremity developed in Dr. Pandy's laboratory at the University of Texas.

These researchers have recently submitted an abstract to the Orthopedic Research Society that details where and how loads in the knee joint are distributed during a walking cycle. The model has shown that most of the load-bearing area arises on the medial side of the knee. This is not surprising, since our doctors often observe more severe osteoarthritic conditions on the medial side of the knee rather than on the lateral side. What is a unique finding of this research is that the total loads in the knee can reach upwards of 449 pounds during simple walking with nearly 334 pounds distributed on the medial side of the knee. One can imagine the kinds of loads that might be expected if we were to conduct similar research on joggers or runners. This study investigated only loads in a knee that is considered to have normal alignment. Malalignments of the lower limb, such as knee varus (bowleggedness) and knee valgus (knocked-knees), can exacerbate the osteoarthritic process by shifting more or less of a load to the medial or lateral side of the knee joint.



To correct malalignments, surgeons often perform a surgical procedure called the high tibial osteotomy (HTO), which alters the loading pattern in the joint.

This research is helping physicians understand just how and why their surgical procedures are reducing loads in the medial and lateral compartments of the knee. This research also provides a basic understanding of the loads that a knee must be able to withstand, which allows physicians to select surgical procedures most appropriate to meet those demands in the active individual.

The Effect of Orthotics in Reducing Knee Loads

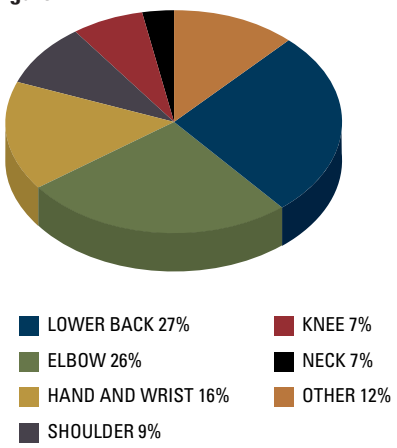
People who suffer from knee joint osteoarthritis as well as physicians who treat these individuals are often searching for conservative, inexpensive yet effective options to alleviate knee pain during athletic activities. The use of foot orthotics have long been utilized in this endeavor. However, while testimonials support their use, little evidence has been able to identify the mechanics by which orthotics alleviate knee pain. The Biomechanics Research Lab has embarked on an ambitious project to better understand how and why orthotics reduce knee loads in osteoarthritic patients. Headed by Dr. Michael Torry and staff scientist Mollie Pflum, the BRL will test numerous individuals who fit the criteria of knee osteoarthritis and lower-extremity varus alignment (bow-leggedness). Researchers will outfit each individual with orthotics of varying heights and consisting primarily of a lateral heel wedge. The patients will walk while the BRL group collects motion and force data. Once completed, the analysis will yield the degree by which each orthotic helped (or did not help) reduce the loading in the knee. With this information, our researchers will be able to make recommendations regarding the proper use, fitting, and degree of knee osteoarthritis and lower-extremity alignment that may benefit from orthotic/heel wedge use as well as determine how and why orthotics work.

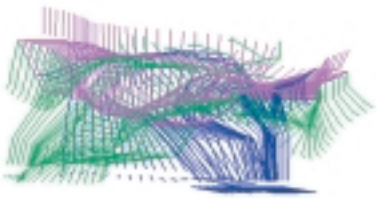
ANALYSIS OF THE GOLF SWING IN THE OVER-60 GOLFER

In amateur golfers, back injuries and back pain constitute 27 percent of injuries, resulting in loss of playing time and medical treatment. The incidence of back injury is followed closely by elbow injury and, to a lesser extent, by hand, wrist, shoulder, and knee maladies (Figure 1).

Golf is one of the most popular sports for men and women over 50 years of age. Unfortunately, golf also requires excessive and repetitive rotary motion about the spine. This motion frequently develops into lower back pain that is often exacerbated by the presence of spine osteoarthritis in this age group. Although some clinicians believe the rotary motion may cause spine-related

Figure 1



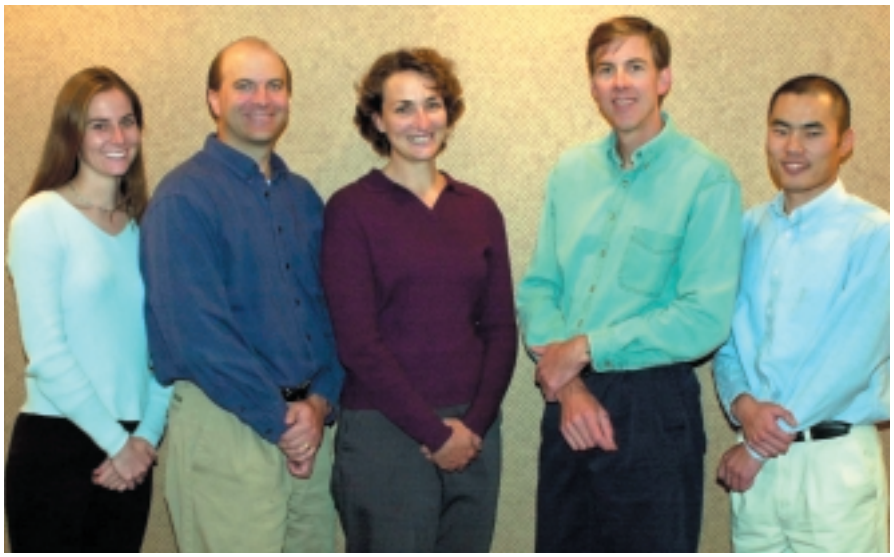


Three-dimensional image of a pitching motion.

osteoarthritis, this has not been proven. Very little information exists to describe the motion of the body in the aging golfer. The Biomechanics group is spearheading a large project to investigate the golf swing mechanics in the golfer over the age of 60. The study includes building an indoor swing center that allows for unrestricted swing analysis using high-speed video capture. With this instrumentation, one can see if the golfer keeps his or her lead arm straight, when the hips break, and can even measure the popular X-factor, a leading variable the golf pros use to define trunk rotation. The study will begin in August 2003. "Once we understand more about what happens to the knees, hips, shoulder, and back in the 60-plus golfer, we will be able to focus on specific injuries that often plague this age group," says Dr. Torry.

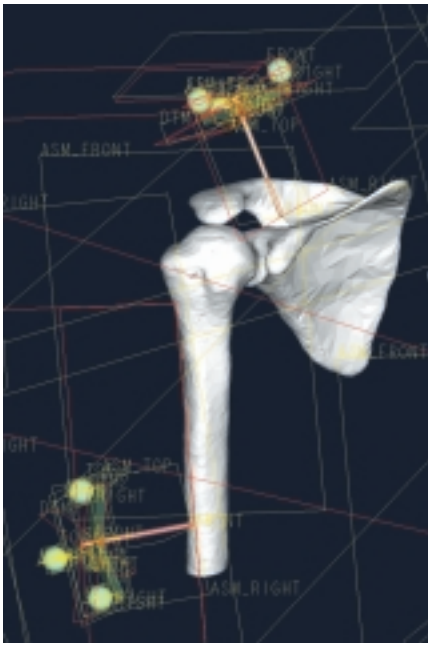
Gender Differences in ACL Injuries: Why Females Tear Their ACL More Often than Males

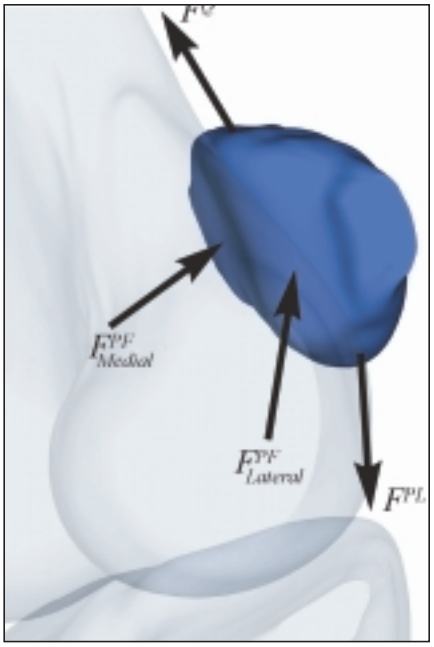
Since the inception of Title IX in 1979, the incidence of females tearing their ACL in non-contact sports (volleyball, basketball, soccer, etc.) has been alarming, with some reports estimating women to be four to eight times more likely to tear their ACL compared to their male counterparts in comparable sports. Understanding how and why this gender disparity occurs has been a three-year endeavor for the Biomechanics group. Most recently, the BRL published a paper that detailed specific landing differences from a jump that exist between age and activity level



Biomechanics Research Laboratory staff, left to right: Colleen Roarty, M.S.; Michael Torry, Ph.D., director; Sarah Hummel, M.S.; Kevin Shelburne, Ph.D.; and Takashi Yanagawa, M.A.

matching male and female athletes. In short, women land in a more erect position (less knee flexion), which tend to create higher loads on the ACL. However, measuring a person's performance in the laboratory has disadvantages, since the landings cannot be harmful in any way and this answers only some of the questions. To further understand how and why the ACL is sometimes injured (in both men and women), staff scientist Molli Pflum and Dr. Marcus Pandy conducted a study at the University of Texas in which the landing data measured on the subjects in the laboratory were used to guide a computer model of the landing motion. With the computer model, the scientists were able to discretely determine what happens inside the knee during the motion, what tissues are loaded, and what factors are contributing most to the ACL injury. And, unlike testing human subjects, the model can be made to perform in a manner that actually tears its ACL.





Left figure: Bone pins are inserted into the humerus and scapula to develop 3-D computer generated shoulder model.

Right figure: Three-dimensional model showing the forces that cause patello-femoral loading.

LITTLE LEAGUE PITCHING MECHANICS

After four years of investigating major league baseball pitching mechanics and injuries, the Biomechanics Research Lab has focused its efforts on attempting to understand the mechanics behind Little League pitchers' throwing patterns and how these patterns contribute to injury potential.

Injuries seen in younger pitchers are much different from those observed in professional pitchers. This observation led us to believe that pitching mechanics are most likely very different as well. Recently, however, the BRL has published several abstracts and papers which detail the mechanics of Little League pitchers and, in conjunction with our professional pitching database, we have been able to compare throwing patterns of developing young pitchers to those of professional mature pitchers. Although significant differences do exist, there are many similarities. For instance, Little League pitchers throw only 50-65 mph fastballs; however, given the shorter distance from home plate to the pitcher's mound, this translates into a professional pitch velocity equivalent of 80-95 mph to the batter. Our research has also shown that Little League pitchers execute the pitch sequence in a similar manner, with major differences from the pros being partly attributed to height, weight and physical strength. So why are the injury patterns so different? We believe it is due to the physical strength and the skeletal maturity of the athletes. As we mature, our tissues become more rigid and able to withstand higher forces. An outcome of our research distinctly shows that young players (as early as 13 years old) need to have proper techniques taught to them. At this age they are already developing pitching mechanics that they will carry with them into adolescence.

Major John Tokish, M.D.: On the Front — and on the Field

The following profile is based on an interview by Richard Needham. Mr. Needham is editor of "Skiing Heritage" magazine and the health newsletter "Arthritis Advisor."

Air Force Major John Tokish, M.D., a Steadman-Hawkins Fellow, has seen his share of action — on the war front and on the athletic field. An orthopaedic surgeon currently stationed at the Air Force Academy in Colorado Springs, Tokish is a team physician ministering to the scrapes, pulls and pains of academy athletes.

It's a job he enjoys — particularly during football season since, as this is written, Air Force is 6-0 for the season and ranks 13th among all college teams in the nation. The Air Force Academy team is a young squad that is already showing signs of soon becoming one of the nation's top college gridiron teams.

These days at the academy are a lot different for Tokish than they were after the terrorist attack on Sept. 11. Shortly after that tragedy, three months after completing his Steadman-Hawkins Fellowship, Maj. Tokish was dispatched to Afghanistan. As one of the first orthopaedic surgeons in the war zone, he was assigned command of the first MFST (Mobile Forward Surgical Team) unit, where he served on the front repairing soldiers from U.S. Special Operations, the Army's elite combat group whose soldiers had found themselves on the receiving end of mine or mortar attacks.

"Fortunately," says Maj. Tokish today, "I had to perform only 25 surgeries during the six months I served on the front, which was certainly good news for our guys.

"Still," he continues, "it wasn't pretty. Most of the surgeries involved amputation from mine explosions and mangled extremities, which wasn't exactly sports medicine. But we did encounter a number of injuries from soldiers jumping out of planes or from combat maneuvers that weren't necessarily surgical in nature but needed an injection or properly directed rehab or bracing. All of this, of course, was extremely valuable to my training."

What Tokish did discover were close similarities between Special Operations soldiers and the athletes that he had been trained to repair.

"Managing the care of a Special Ops soldier is a lot like managing an elite athlete. What struck me at first was the fact that these soldiers were asked to perform at a very high level physically. They are capable of doing things that we don't ask regulars to often do. And their attitude is different. Like a professional athlete, they're not interested in anything other than how fast they can get back to their mission. So your first goal as a surgeon, as with a professional athlete, is education—convincing them that you have the same goal that they do, and that goal is getting them back to the job at hand.

"These soldiers are very dedicated professionals who are willing to sacrifice their lives to complete their mission. And they know they're not going to do that from the sidelines."

As a Fellow who had spent a year at the Steadman-Hawkins Clinic in 2000-2001, Tokish says he's taken away a lot from the experience.

"I learned how to listen to patient concerns. Both Dr. Steadman and Dr. Hawkins were careful to listen to each patient attentively and educate each patient as to the nature of his injury and all the options that were open to him. Almost always, the patient would make the decision that was best for himself and his family or his team. That, in my experience, was true for our soldiers as well."

Equally impressive, says Tokish, was the manner in which the Clinic's doctors treated not only their patients but also their staff. "Dr. Steadman's staff has been with him virtually forever—and there's a reason for that. It's because he treats everyone on his staff with the utmost respect. For all the accolades Dr. Steadman has received in his lifetime, he is still a person who is dedicated to helping others, and he does it with a humility that is very rare, especially among people who have experienced the level of success that he has."

Tokish, who calls Seattle home, was selected as a Fellow in July 2000 from hundreds of others, largely because he had already established himself as one of the top practitioners in the orthopaedic field. Prior to his residency at the University of Arizona Health Sciences Center, Tokish attended the U.S. Air Force Academy for his undergraduate degree in biochemistry and the University of

MFST (MOBILE FORWARD SURGICAL TEAM)

"I learned how to listen to patient concerns. Both Dr. Steadman and Dr. Hawkins were careful to listen to each patient attentively and educate each patient as to the nature of his injury and all the options that were open to him. Almost always, the patient would make the decision that was best for himself and his family or his team. That, in my experience, was true for our soldiers as well."

Washington School of Medicine. His honors include membership in the Alpha Omega Alpha Honor Society, the House Officer Educator of the Year at the University of Arizona, and the Leonard F. Peltier Award for Excellence in Research. He has also been published in the *Journal of Arthroplasty, Techniques in Orthopaedics,* and the *Journal of Orthopaedic Trauma*.

Tokish has reason to be proud of his selection as a Steadman-Hawkins Fellow. Considered one of the top post-residency sports medicine fellowship programs in the world, the Fellowship program is at the core of the Foundation's educational effort.

Each year, six young orthopaedic surgeons are chosen from more than 200 candidates to become Steadman-Hawkins Fellows. They are with the Foundation for an intensive 12-month training program, during which their orthopaedic surgical skills are refined and they investigate the causes, prevention and cure of degenerative arthritis as well as the treatment and prevention of injuries.

The Fellowship program itself (there are now 120 Fellows and associates worldwide) provides benefits in three critical areas: (1) research, which is shared with other orthopaedic centers throughout the world; (2) benefits for thousands of patients as each graduate from the program joins the network of practicing Steadman-Hawkins Fellows; and (3) new techniques that will improve health care and reduce medical costs worldwide.

"Our goal," says Dr. Hawkins, "is to prepare our Fellows to be at the cutting edge of their field for the remainder of their career.

"We're fortunate to work with the best and brightest young physicians in the world. Their insight and enthusiasm during this rewarding program has demonstrated to us many times over that we, too, learn as we teach."

EDUCATION

Richard J. Hawkins, M.D.; Greta Campanale, Coordinator

THE FOUNDATION'S PRIMARY MISSION IS TO CONDUCT RESEARCH THAT CAN BE APPLIED DIRECTLY TO ORTHOPAEDIC MEDICINE. TO THIS END, EDUCATION IS ALSO AN IMPORTANT PART OF OUR WORK. WE OFFER TRAINING THROUGHOUT THE YEAR TO PHYSICIANS IN RESIDENCE, VISITING MEDICAL PERSONNEL, AND ATTENDEES OF INTERNATIONAL MEDICAL MEETINGS. IN ADDITION, THE EDUCATION DEPARTMENT PRODUCES VIDEOTAPES AND EDUCATIONAL PROGRAMS ON THE INTERNET. MEMBERS OF THE STAFF REPORT THEIR RESEARCH THROUGH PUBLICATIONS, PRESENTATIONS AND POSTERS. THE EDUCATION DEPARTMENT PROVIDES ADMINISTRATIVE SUPPORT FOR EDUCATIONAL PROGRAMS AND CONFERENCES, RESPONDS TO THE PRESS, AND TEACHES HIGH SCHOOL STUDENTS ABOUT HUMAN ANATOMY AND INJURY.

FELLOWSHIP PROGRAM: Learning As We Teach

Considered one of the top sports medicine fellowship programs in the world, the Steadman-Hawkins Fellowship is at the core of the Foundation's educational effort. Each year, six young orthopaedic surgeons are chosen from more than 150 candidates to become Steadman-Hawkins Fellows. They are with us for an intensive 12-month training period to refine their skills in orthopaedic surgery and to investigate the causes, prevention, and cures of degenerative arthritis as well as the treatment and prevention of injuries. Our goal is to prepare our Fellows to be the leaders in the field of orthopaedic sports medicine for the remainder of their careers.

The Foundation currently maintains a network of 120 Fellows who share advanced ideas and inspire each other to higher levels. This year we held the Eleventh Annual Fellows Meeting. We are fortunate in Vail to work with the best and the brightest young physicians in the world. Their insight and enthusiasm during this rewarding program has demonstrated to us many times over that we, too, learn as we teach.

2002 FELLOWS

Regarded as one of the most prominent academic fellowship programs in orthopaedic sports medicine, six new orthopaedic surgeons are selected from a pool of more than 150 applicants.

Steadman-Hawkins Fellows spend their year refining skills and learning new techniques from Drs. Steadman, Hawkins and Sterett. The Fellowship program includes an opportunity to participate in research with Foundation scientists. Each Fellow is actively involved in Clinical Research, Basic Science and Rehabilitation/Biomechanics Research. The Fellows experience hands-on medical coverage of major league baseball's Colorado Rockies, the NFL's Denver Broncos and Eagle County High School sports teams.

The stream of knowledge and information flows both ways. The Fellows, having completed their formal training in leading orthopaedic programs, share knowledge they have gained from years of training with the physicians and scientists of the Foundation.

Reed Bartz, M.D.

Dr. Bartz graduated from Southern Methodist University with a degree in economics and then attended the University of Texas at Galveston to study medicine. He completed his residency in orthopaedic surgery at Baylor College of Medicine, where twice he was presented with the Paul Harrington Award for excellence in orthopaedic research. Dr. Bartz is also the recipient of the prestigious Herodicus Society Award for best resident paper by the American Orthopaedic Society for Sports Medicine for his study of the topographical matching of osteochondral transplant donor and recipient sites. He has been published in the *Journal of Bone and Joint Surgery, American Journal of Sports Medicine*, and *Journal of Orthopaedic Trauma*.

Timothy Farley, M.D.

Dr. Farley graduated with honors in psychology from the University of Notre Dame. He attended Rush Medical College in Chicago, where he served as president of the college's chapter of the Alpha Omega Alpha Medical Honor Society. Dr. Farley completed his residency at the Hospital for Special Surgery in New York City, where his research included studying the prevention of ossification after hip surgery, following cell viability of cryopreserved meniscal allografts in the sheep model, and comparing different types of implants in total knee arthroplasty.

Photography: Karen Melhart

2002-2003 Fellows with Drs. Steadman, Hawkins and Sterett: rear, left to right: Dr. Sterett, Scott Hacker, M.D.; James Van den Bogaerde, M.D.; Dr. Steadman; Dr Hawkins; and Michael Milne, M.D. Front, left to right: Timothy Farley, M.D.; Timothy O'Brien, M.D.; and Reed Bartz, M.D.

Scott Hacker, M.D.

Dr. Hacker earned his undergraduate degree in bioengineering at the University of California at San Diego and was also awarded the Regent's Fellowship for a master's degree in bioengineering, in which he concentrated on orthopaedic biomechanics. He then studied medicine at the University of California at Irvine. As an orthopaedic surgery resident at the University of Washington, he pursued his strong interest in clinical and biomechanics research and has been published in the *Journal of Biomechanical Engineering, Journal of Orthopaedic Research*, and *Osteoarthritis and Cartilage*.

Michael Milne, M.D.

Dr. Milne studied economics and finance as an undergraduate at Southern Methodist University and at the London School of Economics before deciding to pursue a career in medicine. He earned his medical degree and completed his residency in orthopaedic surgery at the University of Texas' Southwestern Medical Center. During his residency, Dr. Milne received the Texas Orthopaedic Association award for the Best Resident Paper on "Knee Bridging External Fixation of High Energy Bicondylar Tibial Plateau Fractures."

Timothy O'Brien, M.D.

Dr. O'Brien graduated *cum laude* from Harvard University with a degree in government. After working for two years with an international law firm, he decided to change direction and study medicine. He attended Brown School of Medicine and became interested in orthopaedics while working on several basic science research projects in the laboratory at Rhode Island Hospital. Dr. O'Brien completed his orthopaedic surgery residency at the University of California at San Francisco, where he was involved in the research of functional outcomes following chronic rupture of the patellar tendon.

James Van den Bogaerde, M.D.

Dr. Van den Bogaerde studied biology as an undergraduate at the University of California and attended the University of Chicago's Pritzker School of Medicine. While in medical school, he received the Roche Laboratories Award for Excellence in Basic Science Research at the National Student Forum and the National Institutes of Health Summer Student Research Award. Dr. Van den Bogaerde completed his residency program at the University of California (Davis) Medical Center, where his research projects included comparing hamstring and patellar tendon grafts for MCL reconstruction, as well as studying approaches to the repair of intercondylar humerus fractures.

INTERNSHIP PROGRAM

The Foundation has been fortunate to have the assistance of a talented and dedicated class of graduate school, college, and high school interns. Over the years, the Foundation's internship program has grown both in its scope and the quality of its interns.

Students wishing to develop careers in the orthopaedic field have the opportunity to gain practical research experience in a variety of settings within the Steadman◆Hawkins Sports Medicine Foundation. It is our intent to provide an exceptional learning environment designed to develop world-class researchers in the field of orthopaedic sports medicine, rehabilitation, and human performance. Research is an integral part of patient care and we are dedicated to improving all aspects of health care, including cost-effective treatment and injury prevention, through quality research and education. We wish our interns well in their future careers.

SPECIAL COURSES

Second International Cartilage Symposium

The second International Cartilage Symposium in Vail, Colo., was held Aug. 16-17 and was hosted by the professionals and staff of the Steadman◆Hawkins Sports Medicine Foundation. The two-day meeting, funded by Pfizer, Inc., featured a world-renowned, international faculty of orthopaedic surgeons, each of whom has pioneered innovative procedures for treating articular cartilage injuries. More than 150 physicians attended the symposium.

◆ ◆ ◆

WHERE ARE THEY NOW. . .

The graduating class of 2001/2002 Steadman-Hawkins Fellows are busy establishing new careers in orthopaedics.

Jason W. Folk, M.D., remains in Vail and has joined the Steadman-Hawkins Clinic.

David C. Johnson, M.D., has started a private practice in Alexandria, Va. He plans to open a sports clinic in the Washington, D.C., area with his brother, who is also an orthopaedic surgeon who practices at Johns Hopkins University in Baltimore.

Thomas A. Joseph, M.D., has moved to Youngstown, Ohio, to join an eight-person orthopaedic practice. Dr. Joseph will specialize in sports medicine (shoulder, elbow and knee) surgery. He has also accepted the position of Medical Director of Sports Medicine at St. Elizabeth's Hospital in Youngstown.

Richard L. Lawton, M.D., has moved to Durango, Colo. He is developing a practice specializing in problems involving the knee, shoulder, elbow, and hip.

Bruce S. Miller, M.D., holds a full-time academic position in orthopaedic sports medicine at the University of Michigan in Ann Arbor.

Douglas J. Wyland, M.D., spent a month in California learning more about sports medicine of the foot and ankle, which he will utilize in his new practice at the Steadman-Hawkins Denver Clinic. Along with his clinical duties, Dr. Wyland serves as a team physician for the Colorado Rockies.

Photography: Joe Kania

Biomechanics Research Laboratory interns, left to right: Michael Torry, Ph.D., director; Natalie Danaher; Amy Engle; Nick Kreutzer; Tom Shannon; Jeff Jockel; and Viral Patel.

Co-chairs of the event were Dr. J. Richard Steadman, founder of the Steadman◆Hawkins Sports Medicine Foundation and principal of the Vail-based Steadman-Hawkins Clinic, and Dr. Martin Boublik, principal of the Steadman-Hawkins Clinic's Denver office. The two-day meeting for practicing orthopaedic surgeons included academic sessions and cadaver laboratory demonstrations.

The faculty included the following physicians:

- Dr. J. Richard Steadman, who presented a lecture/demonstration on microfracture, a surgical procedure that he developed that recruits stem cells from bone marrow to form new cartilage over areas in the joint where bare bone is exposed.
- Dr. Lars Peterson from Sweden, who demonstrated autologous chondrocyte transplantation, a two-stage procedure in which cartilage cells are collected from a patient's knee, grown in a laboratory, and re-implanted into the knee defect.
- Dr. Laszlo Hangody of Hungary, who presented his experience with mosaicplasty. In this procedure, pieces of cartilage and bone are removed from a non-weight-bearing area of the knee and transplanted to a weight-bearing surface to fill in where the cartilage has worn away.
- Dr. Allan Gross from Toronto, Canada, who presented his experience with allografting of chondral defects. In this procedure, large segments of bone and cartilage are removed from a donor cadaver knee and implanted into an unusually large defect.
- Dr. Richard J. Hawkins discussed joint surface injuries in the shoulder.

With growing worldwide interest and concern over the increase in degenerative arthritis, this seminar was timely and relevant to both the orthopaedic world and lay community.

PUBLICATIONS AND PRESENTATIONS

A primary goal of the Foundation is to distribute the results of its research. In 2002, principal investigators and Fellows published 25 papers in scientific and medical journals and delivered 89 presentations to a variety of professional and lay audiences worldwide.

In fulfillment of its education mission, the Foundation is proud of the quality and quantity of educational video media produced by the Visual Services Department. At the 69th Annual Meeting of the American Academy of Orthopaedic Surgeons in Dallas, Texas, 25 teaching video presentations were accepted by the Academy. Eight of these videos were produced by the Foundation, and for the third consecutive year the Foundation submitted an award winner: "Diagnostic Wrist Arthroscopy: Equipment, Anatomy and Surgical Technique," by Sumant G. Krishnan, M.D., and Randy W. Viola, M.D.

2002 Publications

Decker, M.J.; Torry, M.R.; Noonan, T.J.; Steadman, J.R.:
"Gait Re-training ACL Reconstructed Individuals," *Archives of Physical Medicine and Rehabilitation* (In press).

Decker, M.J.; Torry, M.R.; Tokish, J.; Ellis, H.E.; Hawkins, R.J.:
"EMG Evaluation of Select Rehabilitation Exercises for the Subscapularis Muscles," *American Journal of Sports Medicine*, 31:126-134, 2002.

Decker, M.J.; Torry, M.R.; Wyland, D.; Noonan, T.J.; Sterett, W.I.; Steadman, J.R.:
"Gait Re-training ACL Reconstructed Individuals," *Clinical Biomechanics* (In press).

Gill, T.J.; McIrvin, E.; Kocher, M.S.; Homa, K.; Mair, S.D.; Hawkins, R.J.:
"The Relative Importance of Acromial Morphology and Age with Respect to Rotator Cuff Pathology," *Journal of Shoulder and Elbow Surgery*, 11:327-330, 2002.

Gill, T.J.; Steadman, J.R.:
"Anterior Cruciate Ligament Reconstruction — the Two-incision Technique," *Orthopedic Clinics of North America*, 33:727-735, 2002.

Hovis, W.D.; Dean, M.T.; Mallon, W.J.; Hawkins, R.J.:
"Posterior Instability of the Shoulder with Secondary Impingement in Elite Golfers," *American Journal of Sports Medicine*, 30:886-890, 2002.

Kim, Y.K.; Sabick, M.B.; Torry, M.R.; Hawkins, R.J.:
"Kinematics and Humeral Torque in Little League Pitchers; Implications about the Injury Mechanisms and the Development of Humeral Torsion," *Journal of Shoulder and Elbow Surgery* (In review).

Kocher, M.S.; Bishop, J.; Marshall, R.; Briggs, K.K.; Hawkins, R.J.:
"Operative vs Nonoperative Management of Acute Achilles Tendon Ruptures: Expected-Value Decision Analysis," *American Journal of Sports Medicine,* 30-783-790, 2002.

Kocher, M.S.; Saxon, H.S.; Hovis, W.D.; Hawkins, R.J.:
"Management and Complications of Anterior Cruciate Ligament Injuries in Skeletally Immature Patients: A Survey of The Herodicus Society and The ACL Study Group," *Journal of Pediatric Orthopaedics*, 22:452-457, 2002.

Kocher, M.S.; Steadman, J.R.; Zurakowski, D.; Briggs, K.; Sterett, W.I.; Hawkins, R.J.:
"Determinants of Patient Satisfaction after Anterior Cruciate Ligament Reconstruction," *Journal of Bone and Joint Surgery*, 84A:1560-1572, 2002.

Motamedi, A.R.; Urrea, L.H.; Hancock, R.E.; Hawkins, R.J.; Ho, C.:
"Accuracy of Magnetic Resonance Imaging in Determining the Presence and Size of Recurrent Rotator Cuff Tears," *Journal of Shoulder and Elbow Surgery*, 11:6-10, 2002.

Piatt, B.E.; Hawkins, R.J.; Fritz, R.C.; Ho, C.P.; Wolf, E.; Schickendantz, M.:
"Clinical Evaluation and Treatment of Spinoglenoid Notch Ganglion Cyst," *Journal of Shoulder and Elbow Surgery*, 11:600-604, 2002.

Powell, E.T.; Tokish, J.M.; Hawkins, R.J:
"Toradol Use in the Athletic Population," *Current Sports Medicine Report*, 1:191, 2002.

Sabick, M.B.; Torry, M.R.; Kim, Y.K.; Hawkins, R.J.:
"Humeral Torque in Professional Baseball Pitchers and its Relationship to Humeral Shaft Fractures and the Development of Humeral Retroversion," *American Journal of Sports Medicine* (In review).

Schlegel, T.F.; Boublik, M.; Hawkins, R.J.; Steadman, J.R.:
"Reliability of the Heel-Height Measurement in Documenting Knee Extension Deficits," *American Journal of Sports Medicine*, 30:479-482, 2002.

Shelburne, K.B.; Pandy, M.G.:
"A Dynamic Model of the Knee and Lower Limb for Simulating Rising Movements," *Computer Methods in Biomechanics and Biomedical Engineering*, 5:149-159, 2002.

Shelburne, K.B.; Pandy, M.G.; Anderson, F.C.; Torry, M.R.:
"Anterior Cruciate Ligament Force During Normal Walking," *Journal of Biomechanics* (In review).

Shelburne, K.B.; Pandy, M.G.; Anderson, F.C.; Torry, M.R.:
"Knee Loading During ACL-Deficient Gait," *Journal of Biomechanics* (In review).

Steadman, J.R.; Hawkins, R.J.; Rodkey, W.G.:
"Microfracture Treatment of Full-Thickness Articular Cartilage Defects In NFL Players." *Professional Football Athletic Trainers Society*. Vol.20 #2, 2002.

Steadman, J.R.; Rodkey, W.G.:
"Microfracture Technique: Treatment of Full-thickness Chondral Lesions." In: *Jackson DW, ed, 2nd ed. Reconstructive Knee Surgery*. Lippincott Williams & Wilkins, New York, Chapter 22, pp 329-335, 2002.

Steadman, J.R.; Rodkey, W.G.; Briggs, K.K.:
"Microfracture to Treat Full-thickness Chondral Defects: Surgical Technique, Rehabilitation, and Outcomes," *Journal of Knee Surgery*, 15:170-176, 2002.

Tokish, J.; Decker, M.J.; Torry, M.R.; Ellis, H.E.; Hawkins, R.J.:
"Clinical Evaluation of Upper and Lower Subscapularis Muscle Activity During the Lift-off and Belly Press Tests," *Journal of Shoulder and Elbow Surgery* (In press).

Tokish, J.M.; Powell, E.T.; Schlegel, T.F.; Hawkins, R.J.:
"Ketorolac Use in the National Football League: Prevalence, Efficacy, and Adverse Effects," *Physician and Sports Medicine*, 30:9, 2002.

Yanagawa, T.; Shelburne, K.; Serpas, F.; Pandy, M.:
"Effect of Hamstrings Muscle Action on Stability of the ACL-Deficient Knee in Isokinetic Exercise," *Clinical Biomechanics*, 17: 705-712, 2002.

Werner, S.L.; Murray, T.A.; Hawkins, R.J.; Gill, T.F.:
"Relationship Between Throwing Mechanics and Elbow Valgus in Professional Baseball Pitchers," *Journal of Shoulder and Elbow Surgery*, 11:151-155, 2002.

2002 Presentations

Boublik, M.:
"Chronic atraumatic bilateral shoulder posterior subluxation," *Hawkins Society Meeting,* Vail, Colo., July 2002.

Co-chairman, Vail Cartilage Symposium, An *International Symposium on the Treatment of Articular Cartilage Injuries*, Vail, Colo., August 2002.

"Reconstructive surgery of the anterior cruciate ligament," *Capstone Chiropractic Educational Conference,* Denver, Colo., September 2002.

Cameron, M.L.; Briggs, K.K.; Kocher, M.S.; Horan, M.P.; Hawkins, R.J.
"Prevalence of OA in patients with shoulder instability," *American Academy of Orthopaedic Surgeons, 68th Annual Meeting,* Dallas, Texas, February 2002.

Cameron, M.L.; Briggs, K.K.; Kocher, M.S.; Horan, M.P; Hawkins, R.J.
"Prevalence of OA in patients with shoulder instability." *American Orthopedic Society for Sports Medicine Specialty Day*, Dallas, Texas, February 2002.

Decker, M.J.; Torry, M.R.; Ellis, H.B.; Tokish, J.J.; Hawkins, R.J.
"Muscle Activation differences between the upper and lower subscapularis muscles during abduction and rotation," *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

◆ ◆ ◆

Decker, M.J.; Torry M.R.; Wyland D.J.; Sterett, W.I.; Steadman, J.R.:
"Gender differences in lower extremity shock absorption during vertical drop landings." *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

Hawkins, R.J.:
"Update on Rotator Cuff Disease," *Pfizer Sports Medicine Consultant Meeting*, Vail, Colo., January 2002.

"Indications for Thermal Energy in the Shoulder" Symposium: The Current Role of Thermal Energy in the Shoulder: To Shrink or not to Shrink." *69th Annual Meeting, AOSSM Specialty Day*, Dallas, Texas, February 2002.

Instructional Course Lecture 348 Open and Arthroscopic Instability Repairs, "The Principles and Techniques of Heat Application for Shoulder Instability with and without Plication," *American Academy of Orthopaedic Surgeons, 69th Annual Meeting*, Dallas, Texas, February 2002.

"Complications of Rotator Cuff Tears," *Swedish Medical Center Section of Orthopedic Surgery*, March 2002

"Electrothermal Arthroscopic Shoulder Capsulorrhaphy Instability: A Minimum Two-Year Follow-up," COA / AOA, *A Joint Meeting*, Victoria, B.C., June 2002.

"Thermal Capsulorrhaphy: What's Hot, What's Not," COA / AOA, moderator and speaker, *A Joint Meeting*, Victoria, B.C., June 2002.

"Case Presentation," COA / AOA, moderator and speaker, *A Joint Meeting*, Victoria, B.C., June 2002.

"The Effect of Immobilization on Long-term Rotator Cuff Healing Using Modified Mason-Allen Stitches: A Biomechanical and Histological Study in Sheep," COA/ AOA, *A Joint Meeting*, Victoria, B.C., June 2002.

"Biomechanics of the Shoulder — A Model for Retroversion in the Thrower." *28th Annual Herodicus Meeting*, Ponte Vedra Beach, Fla., June 2002

"Steadman◆Hawkins Sports Medicine Foundation," *Vail Eagle Valley Rotary Club*, Manor Lodge, Vail, Colo., June 2002.

"Electrothermal Arthroscopic Shoulder Capsulorrhaphy Instability: A Minimum Two-Year Follow-up," *28th Annual Meeting of the American Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

"Biceps Tendon Disorders," *Hawkins Society*, Vail, Colo., July 2002.

"CuffPatch — Why We're Better!" *Arthrotek*, Las Vegas, Nev., July 2002.

"Scapulothoracic Fusions," 20th Century Orthopaedic Association, *57th Annual Meeting, American Club*, Kohler, Wisc., August 2002.

"Shoulder Cartilage Injuries," *Vail Cartilage Symposium*, Vail, Colo., August 2002.

"Update on Rotator Cuff Disease," *Visiting Professor, University of Colorado School of Medicine*, October 2002.

"Ergogenic Aids," *Colorado Rockies Training & Medical Staff Retreat*, Phoenix, Ariz., November 2002.

"Overview in Posterior Instability," *Instructional Course Lecture, 4th ACASA*, Seoul, Korea, November 2002.

"Shoulder Problems in the Overhead Athlete," *Special Lecture, 4th ACASA*, Seoul, Korea, November 2002.

"Rotator Cuff and Biceps Tendon Update," *Symposia, 4th ACASA*, Seoul, Korea, November 2002.

Joseph, T.A.; Sabick, M.B.; Torry, M.R.; Decker, M.J.; Schlegel, T.; Hawkins, R.J.:
"An analysis of shoulder distraction forces in little league pitchers," Poster Presentation, *28th Annual Meeting of the American Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

Kim, Y-K; Sabick, M.B.; Torry, M.R.; Hawkins, R.J.:
"Humeral torque in professional baseball pitchers and its relationship to humeral shaft fracture and the development of humeral retroversion." *4th Academic Congress of the Asian Shoulder Association*, Seoul, Korea, October 2002.

Kim,Y-K; Tokish, J.M.; Torry, M.R.; Sabick, M.B.; Hawkins, R.J.:
"The relationship between humeral retroversion and shoulder rotation in major league baseball pitchers," *4th Academic Congress of the Asian Shoulder Association*, Seoul, Korea, October 2002.

Kim, Y-K; Sabick, M.B.; Torry, M.R.; Hawkins, R.J.:
"Humeral torque in youth baseball pitchers: Implications for the development of little league shoulder and humeral retroversion," *4th Academic Congress of the Asian Shoulder Association*, Seoul, Korea, October 2002.

Kocher, M.S.; Steadman, J.R.; Zurakowski, D.; Briggs, K.K.; Sterett, W.I.; Hawkins, R.J.:
"Determinants of Patient Satisfaction after ACL Reconstruction," Poster Presentation, *American Academy of Orthopaedic Surgeons*, *68th Annual Meeting*, Dallas, Texas, February 2002.

Kocher, M.S.; Steadman, J.R.; Zurakowski, D.; Briggs, K.K.; Sterett, W.I.; Hawkins, R.J.:
"Relationship of Instrumented Knee Laxity, Lachman Examination, and Pivot-shift Examination to Subjective Symptoms and Function After ACL Reconstruction," *American Academy of Orthopaedic Surgeons, 68th Annual Meeting*, Dallas, Texas, February 2002.

Kocher, M.S.; Steadman, J.R.; Briggs, K.K.; Sterett, W.I.:
"Relationship of Instrumented Knee Laxity, Lachman Examination, and Pivot-shift Examination to Subjective Symptoms and Function After ACL Reconstruction," *28th Annual Meeting of the American Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

Krishnan, S.G.; Hawkins, R.J.; Karas, S.G.; Horan, M.P.; Noonan, T.J.:
"Electrothermal Arthroscopic Shoulder Capsulorrhaphy: A Minimum Two-Year Follow-up." *28th Annual Meeting of the American Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

Kocher, M.S.; Saxon, H.S.; Hovis, W.D.; Hawkins, R.J.:
"Management and Complications of ACL Injuries in Skeletally Immature Patients: A Survey of the Herodicus Society and the ACL Study Group," *American Academy of Orthopaedic Surgeons, 68th Annual Meeting*, Dallas, Texas, February 2002.

Krishnan, S.G.; Steadman, J.R.; Millett, P.J.; Hydeman, K.; Close, M.:
"Lysis of Pretibial Patellar Tendon Adhesions (Interval Release)," Poster Presentation, *American Academy of Orthopaedic Surgeons*, *68th Annual Meeting, Dallas*, Texas, February 2002.

Krishnan, S.G.; Steadman, J.R.; Millett, P.J.; Hydeman, K.; Close, M.:
"Lysis of Pretibial Patellar Tendon Adhesions (Interval Release)," Poster Presentation, *Arthroscopy Association of North America Annual Meeting*, Washington, D.C., April 2002.

Miller, B.S.; Noonan, T.J.; Horan, M.P.; Hawkins, R.J.:
"Rupture of the Subscapularis Tendon After Open Anterior Instability Surgery: Diagnosis, Treatment, and Outcome," *28th Annual Meeting of the American Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

Millett, P.; Torry, M.R.; Pflum, M.; Decker, M.J.; Steadman, J.R.:
"Muscular weakness causes increased adductor moment during gait," Poster Presentation. *28th Annual Meeting of the Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

Millett, P.J.; Miller, B.S.; Sterett, W.I.; Walsh, W.; Hawkins, R.J.:
"Effects of Braiding on Tensile Properties of Four-Strand Human Hamstrings Grafts," Poster Presentation, *28th Annual Meeting of the Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

O'Holleran, J.D.; Kocher, M.S.; Horan, M.P.; Briggs, K.K.; Hawkins, R.J.:
"Determinants of Patient Satisfaction with Outcome after Rotator Cuff Surgery," Poster Presentation, *American Orthopedic Society Sports Medicine Annual Meeting*, Orlando, Fla., July 2002.

Pflum, M.; Torry, M.R.; Millett, P.; Decker, M.J.; Steadman, J.R.:
"Quadriceps weakness causes an increase in the peak adductor moment during gait," *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

Pflum, M.A.; Shelburne, K.B.; Torry, M.R.; Decker, M.F.; Pandy, M.G.:
"A Comparison of ACL Force During Soft and Stiff Drop Landings," *IVth World Congress of Biomechanics*, Calgary, Canada, August 2002.

Rodkey, W.G.:
"Treatment of articular lesions: Microfracture," *Arthroscopy and Reconstructive Surgery 2002 – The Robert W. Metcalf Memorial Meeting*, Salt Lake City, Utah, January 2002.

"The surgical treatment of articular cartilage defects of the knee: Microfracture technique," *Instructional Course Lecture, American Academy of Orthopaedic Surgeons*, Dallas, Texas, February 2002.

"Articular cartilage injury in the athlete: Treatment option in 2002. Microfracture technique," *Instructional Course Lecture, American Academy of Orthopaedic Surgeons*, Dallas, Texas, February 2002.

"Update on articular cartilage surgery in the knee: Marrow stimulating techniques," *Arthroscopy Association of North America Specialty Day*, Dallas, Texas, February 2002.

"Patient satisfaction and functional outcome after microfracture of the degenerative knee," *International Cartilage Repair Society*, Toronto, Canada, June 2002.

"Tendinosis and tendinitis: Basic science and etiologic factors," *Instructional Course Lecture, American Orthopaedic Society for Sports Medicine*, Orlando, Fla., July 2002.

"Microfracture: Basic science rationale and long-term results," *3rd International Heidelberg Orthopaedic Symposium: Knee and Shoulder Update*, Heidelberg, Germany, July 2002.

"Basic science of articular cartilage," *Vail International Cartilage Symposium*, Vail, Colo., August 2002.

Rodrigo, J.J.; Steadman, J.R.; Briggs, K.K.; Kocher, M.S.; Gill, T.J.; Rodkey, W.G.:
"Outcomes of Microfracture for Traumatic Chondral Defects of the Knee: Average 11-year Follow-up," *Arthroscopy Association of North America Annual Meeting*, Washington, D.C., April 2002.

Sabick, M.B.; Torry, M.R.; Hawkins, R.J.:
Differences in kinematics between professional and youth baseball pitchers," *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

Sabick, M.B.; Torry, M.R.; Hawkins, R.J.:
"Humeral torque in youth baseball pitchers: Implications for the development of humeral retroversion," *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

Schlegel, T.F.:
"Injuries in NFL Athletes," *Orthopedic Pro Tech Conference and Workshop*, Denver, Colo., May 2002.

"Using 'The Cuff Path' to augment Rotator Cuff Deficiencies," *New Techniques in Sports Medicine*, Oakmont, Pa., August 2002.

"Techniques and Advances in Rotator cuff Repairs," *2nd Annual San Diego Area College Athletic Trainers Meeting*, San Diego, Calif., December 2002.

Schlegel, T.F.; Hawkins, R.J.:
"Grade III AC separation in NFL Quarterbacks," *NFL Physicians Society Scientific Meeting*, Indianapolis, Ind., May 2002.

Shelburne, K.B.; Pandy, M.G.; Anderson, F.C.; Torry, M.R.:
"Anterior-Cruciate Ligament Forces in the Intact Knee During Normal Gait," *IVth World Congress of Biomechanics*, Calgary, Canada, August 2002.

Shelburne, K.B.; Pandy, M.G.; Anderson, F.C.; Torry, M.R.:
"Ligament Forces in the Anterior Cruciate Deficient Knee During Gait," *IVth World Congress of Biomechanics,* Calgary, Canada, August 2002.

Shelburne, K.B.; Pandy, M.G.:
"Hamstrings Action Alone Cannot Limit Anterior Tibial Translation in ACL-Deficient Gait," *IVth World Congress of Biomechanics*, Calgary, Canada, August 2002.

Steadman, J.R.:
"Rehabilitation of the ACL Injured and Reconstructed Knee," *Frontiers in Sports Medicine — The Athlete in 2002*, La Jolla, Calif., February 2002.

"Microfracture and the Collagen Meniscal Implant," *Frontiers in Sports Medicine — The Athlete in 2002*, La Jolla, Calif., February 2002.

"Combined Osteotomy and Ligament Reconstruction," *Frontiers in Sports Medicine — The Athlete in 2002* , La Jolla, Calif., February 2002.

"Anterior Interval Release," *ACL Study Group Meeting,* Big Sky, Mont., March 2002.

"The Microfracture Technique," *4th Internal Cartilage Repair Society Symposium Outcomes of Surgical Cartilage Repair Symposium*, Toronto, Canada, June 2002.

"The Collagen Meniscal Implant," *American Orthopaedic Society for Sports Medicine Annual Meeting,* Orlando, Fla., July 2002.

"Microfracture Technique," *3rd International Heidelberg Orthopaedic Symposium,* Heidelberg, Germany, July 2002.

"The Microfracture Technique," *Vail Cartilage Symposium,* Vail, Colo., August 2002.

"Arthroscopy for Degenerative Joint Disease in the Knee," *Vail Cartilage Symposium*, Vail, Colo., August 2002.

"The Microfracture Technique," *Current Issues of MRI 11th Annual Symposium*, San Francisco, Calif., August 2002.

"The Microfracture Technique: Basic Science, Technique, and Long-Term Results," 3*rd Annual Articular Cartilage Course for Sports Medicine Fellows*, La Jolla, Calif., December 2002.

Steadman, J.R.; Cameron, M.L.; Briggs, K.K.; Rodkey, W.G.:
"A Minimally Invasive Technique ("Healing Response") to Treat Acute ACL Injuries in Patients 40 Years and Older," Poster Presentation, *American Academy of Orthopaedic Surgeons, 68th Annual Meeting*, Dallas, Texas, February 2002.

Steadman, J.R.; Cameron, M.L.; Briggs, K.K.; Rodkey, W.G.:
"A Minimally Invasive Technique ("Healing Response") to Treat Acute ACL Injuries in Patients 40 Years and Older," Poster Presentation, *Arthroscopy Association of North America Annual Meeting*, Washington D.C., April 2002.

Sterett, W.I.:
"High Tibial Osteotomy and Chondral Resurfacing in the Varus Knee," *Vail Cartilage Symposium*, Vail, Colo., August 2002.

Tokish, J.; Decker, M.J.; Torry, M.R.; Ellis, H.E.; Hawkins, R.J.:
"Upper and lower subscapularis muscle activity during the lift-off and belly press tests," *American Society of Shoulder and Elbow Surgeons, Finalist for Neer Award*, Dallas, Texas, February 2002.

Torry, M.R.; Yanagawa, T.; Shelburne, K.B.; Steadman, J.R.; Sterett, W.I.:
"Tibiofemoral kinematics and contact patterns are altered due to weakness of the semitendinosus and gracilis muscles," *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

Wyland, D.J.; Decker, M,J,; Steadman, J.R.; Torry, M.R.; Sterett, W.I.:
"Gender differences in lower extremity positions and muscular shock absorption during landing," *28th Annual Meeting of the American Orthopedic Society of Sports Medicine*, Orlando, Fla., July 2002.

Yanagawa, T.; Torry, M.R.; Shelburne, K.; Steadman, J.R.; Sterett, W.I.:
Evaluation of tibiofemoral compressive and shear loads in the medial and lateral knee compartments during isometric exercises," *Proceedings of IV World Congress of Biomechanics*, Calgary, Canada, August 2002.

Yanagawa, T.; Shelburne, K.B.; Serpas, F.; Pandy, M.G.:
"Effect of Hamstrings Muscle Action on Stability of the ACL-deficient knee," *IVth World Congress of Biomechanics*, Calgary, Canada, August 2002.

Video presentations accepted by the American Academy of Orthopaedic Surgeons, 69th Annual Meeting, Dallas, Texas

Diagnostic Wrist Arthroscopy: Equipment, Anatomy and Surgical Technique, Sumant G. Krishnan, M.D.; and Randy W. Viola, M.D.

An Update on Acromioclavicular Injuries, Theodore F. Schlegel, M.D.; Martin Boublik, M.D.; and Richard J. Hawkins, M.D.

Surgical Technique for Subscapularis Repair, Biceps Tenodesis and Margin Convergence Rotator Cuff Repair, Sumant G. Krishnan, M.D.; and Richard J. Hawkins, M.D.

Arthroscopic Assessment and Treatment of Partial-Thickness Tears of the Rotator Cuff, Sumant G. Krishnan, M.D.; and Richard J. Hawkins, M.D.

Two-Incision ACL Reconstruction, David S. Gazzaniga, M.D.; and J. Richard Steadman, M.D.

Surgical Treatment of the Arthrofibrotic Knee, Peter J. Millett, M.D.; and J. Richard Steadman, M.D.

Advanced Stretching and Strengthening of the Colorado Rockies, Richard J. Hawkins, M.D.; and John M. Tokish. M.D.

The Athlete's Shoulder Tour, edited by Richard J. Hawkins, M.D.; and Michael L. Pearl.

RECOGNITION

The Steadman◆Hawkins Sports Medicine Foundation is proud of the many advances it has made in 2002. These achievements are examples of the quality contributions made to orthopaedics and science.

STEADMAN◆HAWKINS SPORTS MEDICINE FOUNDATION RESEARCH WINS INTERNATIONAL BIOMECHANICS AWARD

International Society Praises Foundation's Research

The American Society of Biomechanics (ABS) has selected the abstract "Anterior-Cruciate Ligament Forces in the Intact Knee During Normal Gait" as winner in the 2002 *Journal of Biomechanics* Award competition. Kevin Shelburne, Ph.D.; Marcus Pandy, Ph.D.; Frank C. Anderson, Ph.D.; and Michael Torry, Ph.D., jointly authored the abstract.

Dr. Shelburne is senior staff scientist of the Biomechanics Research Laboratory at the Steadman◆Hawkins Sports Medicine Foundation. The award, one of the most prestigious in the biomechanics field, was presented to the winner at the Fourth World Congress on Biomechanics (WCB) in August in Calgary.

"We [doctors in biomechanics] help [medical] doctors understand the mechanics of knee joints," says Dr. Torry. "With this information, doctors can make better choices of treatment plans." The awarded research shows what happens to a healthy knee while walking and a knee that has a torn ACL. "We discovered that without the ACL," says Dr. Torry, "all ligaments have to make up for what the ACL isn't doing."

The World Congress of Biomechanics, a conference held every four years, hosts biomechanists from around the world and includes much of the best biomedical research conducted during the previous four-year period. The goal of the Congress is to facilitate the exchange of cutting-edge research in biomechanics. More than 1,100 communications and 500 symposia speakers were invited to participate in the meeting. Abstracts representing every continent and 47 countries were also presented.
The ASB *Journal of Biomechanics* Award, sponsored by Elsevier Science, Ltd., publishers of the *Journal of Biomechanics*, recognizes substantive and novel mechanics approaches that explain how biological systems function. Candidates for the award are selected from a pool of the top-rated 20 percent of abstracts submitted to the WCB meeting. The ASB Awards Committee selects two finalists for the award and both of these two authors present their work in a special awards session at the meeting.

According to Dr. Shelburne, the award is the Super Bowl of biomechanical research. "Just being a finalist for this award is a great honor. To have our work selected from among the work of such an elite group of researchers is most gratifying." Dr. Shelburne received his bachelor of science degree in mechanical engineering from Texas A&M University in 1985. He was awarded an M.S. degree in mechanical engineering from Texas A&M in 1988 while specializing in robotics. Before returning to graduate study at the University of Texas at Austin, Dr. Shelburne spent three years working for McDonnell Douglas Space Systems on the International Space Station project.

In 1997, Dr. Shelburne received his Ph.D. in mechanical engineering from the University of Texas, where he specialized in biomechanics under the direction of Dr. Marcus Pandy. The focus of much of his work with Dr. Pandy was in computer modeling and simulation of the mechanics of the normal and reconstructed knee joint. Following graduation, Dr. Shelburne spent three years with Lockheed Martin Space Systems, working on the design of new launch vehicles. Dr. Shelburne joined the Steadman◆Hawkins Sports Medicine Foundation in March 2000.

The American Shoulder and Elbow Society (ASES) awarded the Clinical Research Department a $6,500 grant. According to Karen Briggs, director of Clinical Research, the funding will be used to validate the ASES Shoulder Score, a subjective patient outcome scoring system used to measure patient function.

At the 69th Annual Meeting of the American Academy of Orthopaedic Surgeons, the Foundation submitted an award-winning video, "Diagnostic Wrist Arthroscopy: Equipment, Anatomy and Surgical Technique," which was produced by Sumant G. Krishnan, M.D.; and Randy W. Viola, M.D.

KNEE LIGAMENT FORCES DURING WALKING
An award-winning study examines knee ligament function.

By Kevin Shelburne, Ph.D.

The American Society of Biomechanics has selected this study as winner in the 2002 Journal of Biomechanics *award competition. Kevin Shelburne, Ph.D.; Marcus Pandy, Ph.D.; Frank C. Anderson, Ph.D.; and Michael Torry, Ph.D., jointly authored the abstract. In recognition of this research, the authors were presented the* Journal of Biomechanics *award at the World Congress of Biomechanics in August.*

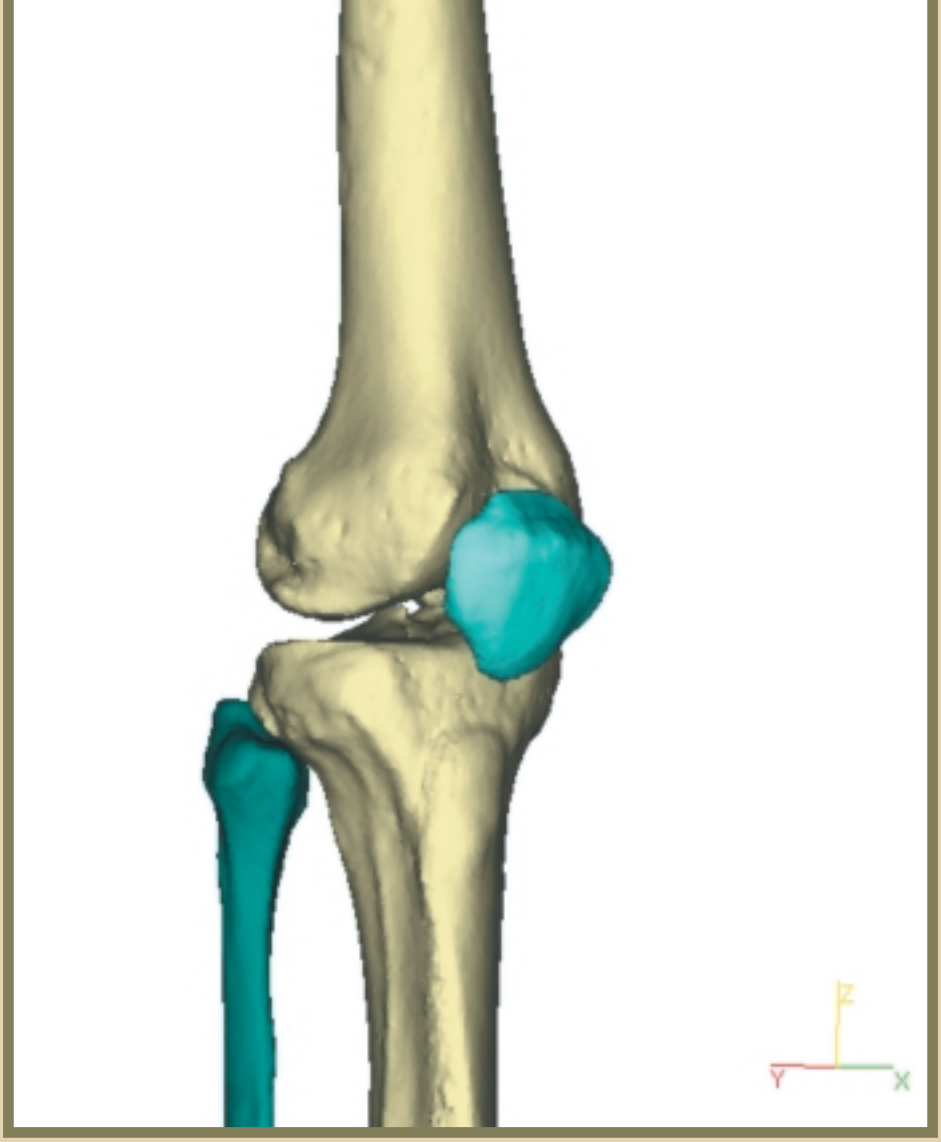
When we walk, a mysterious and complex balance of forces in our muscles, bones, and ligaments keeps us moving forward in an activity that many of us take for granted. For those with knee ligament injuries and injury to the anterior cruciate ligament (ACL), returning to normal walking can be a real challenge. The knee's ACL provides a strong elastic link between the femur and tibia. Injury of the ACL often leads to knee instability that requires the individual to adapt his walking style to remain mobile. Even though injury to the ACL is common and debilitating, little is known about how the ligament carries force during walking and other activities of daily living. This is because there exists no practical way to measure the force carried by the ACL. Nonetheless, knowledge of how the ACL works during walking may provide clinicians with valuable information in order to better design treatment and rehabilitation protocols. For this reason, many orthopaedic researchers have long sought to explain how the ACL carries force and stabilizes the knee.

A collaboration of scientists at the University of Texas and the Steadman◆Hawkins Sports Medicine Foundation sought to predict and explain the role of the ACL during walking. One of the great challenges of predicting ligament force is that muscle force largely determines the resulting force in the ligaments. Muscle forces can be surprisingly large during activities of daily living. During walking, for example, the muscles of the thigh generate force that may be one and a half times as great as the total weight of the body.

This problem has confounded previous efforts by other researchers since, as previously noted, there is no practical way to directly measure muscle force. To address the problem, the collaborators used detailed mathematical representations of the musculoskeletal system and computer simulation. Computer simulation enables the exploration of places that have no other way of being reached. For this reason, computer simulation has been used for years for the design and testing of spacecraft. Using some of the same basic concepts and computing tools, a sophisticated computer simulation of human walking was developed and applied at the University of Texas by Frank Anderson (now a research associate at Stanford University) and Marcus Pandy (a member of Steadman◆ Hawkins Sports Medicine Foundation's scientific advisory committee and professor of Biomedical Engineering at the University of Texas).

The muscle forces predicted by the walking simulation were then input by Kevin Shelburne of the Foundation's Biomechanics Research Laboratory into a second computer simulation composed of a highly detailed model of the bones, ligaments, and muscles at the knee. The computer model of the knee used to predict ACL force included all of the major ligaments and muscles spanning the knee and was originally developed by Marcus Pandy, Kotaro Sasaki and Seonpil Kim at the University of Texas.

The results of the simulation demonstrated that the ACL carries substantial force (equivalent to about half the weight of the body) throughout the stance phase of walking (when the foot is on the floor and not swinging forward). Furthermore, the results demonstrated that the forces in the thigh muscles largely determine the force on the ACL. This knowledge may lead to a more precise definition of when and how walking is used in rehabilitation protocols following ACL injury and repair.



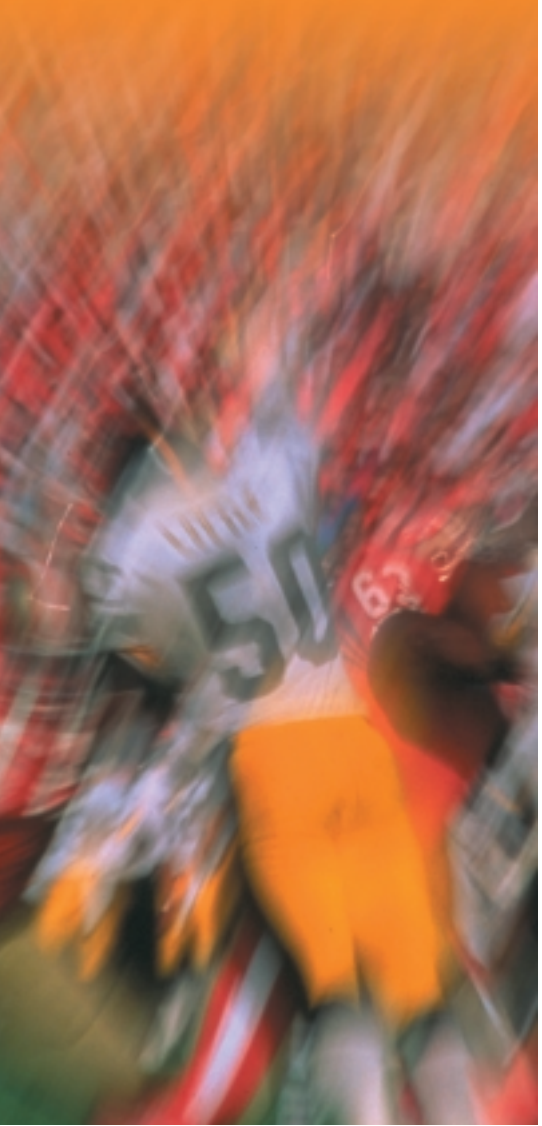
Three-dimensional model of the knee.

One of the unique advantages of computer simulation is that "what if" questions can be readily asked by making changes to the model. For walking, an additional computer simulation was performed after cutting the ACL in the computer model of the knee. In this way, the computer model performed walking with a simulated ACL injury. In order for the model to compensate for the absence of the ACL and the stability it provides, the computer simulation was changed to coordinate the thigh muscles in a way that was found to be similar to the way in which people with ACL injuries appear to move. The results of this simulation lend support to the effectiveness of many of the exercises and therapies that have been recommended for individuals with an ACL injury and repair.

In the future, additional computer simulations will investigate the performance of the ACL during demanding activities such as jumping, landing and running. Unlocking the mysteries of how the ligament stabilizes the knee and interacts with the muscles and bones during activity requires patience and advanced technology, but the benefit is a better understanding of how best to repair and rehabilitate the injured knee.

IN THE MEDIA

THE STEADMAN◆HAWKINS SPORTS MEDICINE FOUNDATION ONCE AGAIN ENJOYED EXTENSIVE NATIONAL AND INTERNATIONAL MEDIA COVERAGE IN 2002.



In February, the world not only focused its attention on Salt Lake City and the 2002 Winter Olympics, but on the sensational American skier **Bode Miller** and the healing response procedure pioneered and performed by Dr. Steadman to repair Miller's ACL. Miller, who had injured his ACL the year before, went on to win two silver medals and finished second in the overall World Cup slalom standings. Major stories on Miller and the healing response appeared in the Nov. 4 and 11 ***Denver Post*** ("Miller's Miracle: Healed Knee," by John Meyer) and the Feb. 8 ***Boston Globe*** ("Easy Rider," by Tony Chamberlain). **NBC Sports** Olympic coverage also covered the story in a feature on Miller and Dr. Steadman. NBC Sports journalists Todd Brooker and Christin Cooper-Tache—both former Steadman-Hawkins patients—prepared the piece as part of NBC's Olympic coverage. Miller's performance was the best in 18 years by an American male since Phil Mahre's Olympic slalom win in 1984 (Mahre was also a Steadman patient). **Ivica Kostelic**, another former patient of Dr. Steadman's, topped Miller in the Olympic slalom standings and went on to win the overall World Cup slalom title.

RED BRICK KNEE AND SHOULDER HOSPITAL

With more than 80 percent of orthopaedic surgeons worldwide now using microfracture as an alternative to knee replacement, it's no wonder that many of the world's top athletes travel to Vail for treatment of their injuries. News media from London, Berlin, and Rome reported on the health of their country's soccer stars who trek to Vail. As reported in the news media, Renaldo, Matthäus, Diesler, Del Piero and Redknapp have all visited the exam rooms of the Steadman-Hawkins Clinic in Vail. In the Oct. 2, 2002, issue of the German magazine ***Stern***, Dr. Steadman and the Foundation were featured in the article "Retter der Knickten" (Rescuer of the Broken). "From all over the world," said the article, "famous people with knee injuries make the pilgrimage to [Dr.] Richard Steadman in Colorado. The orthopaedic surgeon healed Oliver Kahn, Marc Girardelli and Martina Navratilova with his innovative operating techniques. Eighteen specialists at the Sports Medicine Foundation conduct research in the basement of the red brick knee and shoulder hospital."

With microfracture gaining acceptance, other medical disciplines are beginning to become aware of this procedure, which was pioneered by Dr. Steadman and developed by the Foundation. ***Family Practice News***, a magazine whose audience consists of primary-care physicians, published the article "Microfracture Knee Repair: Less Pain, More Gain" in its Oct. 15, 2002, issue. "The microfracture technique for repair of articular damage in the knee," said the article, "shows impressive benefits in a series of athletes followed for 11-plus years." The article also mentions a Foundation paper Dr. Steadman presented at the symposium of the

International Cartilage Repair Society. The study involved 14 National Football League players on whom he performed microfracture. The players were followed for a mean of 6.5 and a maximum of 14 years afterward. "The most important outcome measure in this group of pro athletes was this: 13 of the 14 were able to return to the NFL, where they averaged another six seasons and 74 games of play.

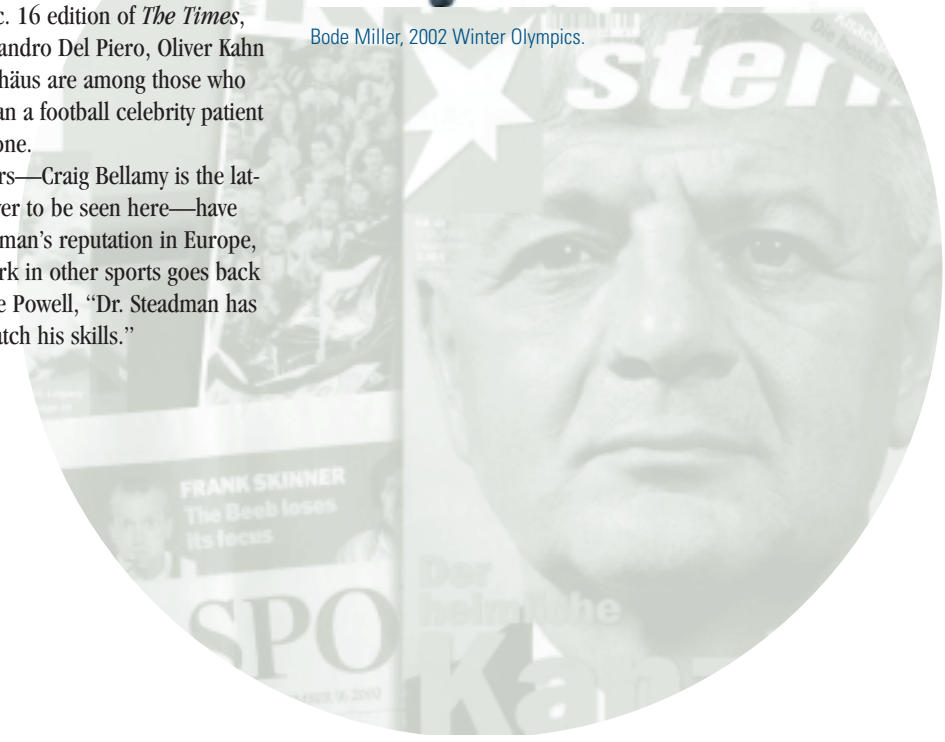
"We felt this was a validation of the procedure," says Dr. Steadman. "These are supersized athletes—their average weight is about 275 pounds—and we felt this must be pretty durable tissue if it's holding up as well as it has for them."

The international media continued its focus on the work of the Steadman◆Hawkins Sports Medicine Foundation and its physicians, especially since many of the world's soccer stars have been making their way to Vail, Colo., for treatment. Journalist David Powell of ***The Times*** of London flew to Vail in December to do a story on Dr. Steadman and the Foundation. Of Dr. Steadman, Powell wrote in the Dec. 16 edition of *The Times*, "Ronaldo, Alessandro Del Piero, Oliver Kahn and Lothar Matthäus are among those who give Dr. Steadman a football celebrity patient list second to none.

"Footballers—Craig Bellamy is the latest premier player to be seen here—have grown Dr. Steadman's reputation in Europe, although his work in other sports goes back 30 years." Wrote Powell, "Dr. Steadman has a modesty to match his skills."

Bode Miller, 2002 Winter Olympics.

Photography: AP/Wide World Photos



ASSOCIATES

The Steadman◆Hawkins Sports Medicine Foundation is proud to recognize its team of associates, who carry out the Foundation's research and educational mission in Vail. The staff has been nationally selected for their diverse training and backgrounds in biomechanics, engineering, clinical research, veterinary science, and computer science. Together, they take a multidisciplinary approach to their work in solving orthopaedic sports medicine problems.

ADMINISTRATION

James F. Silliman, M.D.
Chief Executive Officer and President

John Welaj, M.B.A.
Chief Operating Officer

Karyll Nelson
BioSkills Laboratory Director and Executive Assistant

DEVELOPMENT

John G. McMurtry, M.A., M.B.A.
Vice President for Program Advancement

Rachele Palmer
Development Assistant/Data Base Administrator

Amy Ruther
Development Coordinator

BASIC SCIENCE

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

CLINICAL RESEARCH

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

Marilee Horan
Research Associate

Liz Barry
Research Associate

BIOMECHANICS RESEARCH LABORATORY

Michael Torry, Ph.D.
Director

Kevin B. Shelburne, Ph.D.
Senior Staff Scientist

Takashi Yanagawa, M.A.
Research Fellowship/Internship

EDUCATION

Greta Campanale
Coordinator

INFORMATION SYSTEMS

Jean Claude Moritz
Manager

VISUAL SERVICES

Joe Kania
Coordinator

Karen Melhart
Coordinator

Photography: Joe Kania

INDEPENDENT ACCOUNTANTS' REPORT

Board of Directors
Steadman◆Hawkins Sports Medicine Foundation
Vail, Colorado

We have audited the accompanying statements of financial position of Steadman◆Hawkins Sports Medicine Foundation as of December 31, 2002 and 2001, and the related statements of activities, cash flows and functional expenses for the years then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these 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 financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Steadman◆Hawkins Sports Medicine Foundation as of December 31, 2002 and 2001, and the changes in its net assets and its cash flows for the years then ended in conformity with accounting principles generally accepted in the United States of America.

BKD, LLP

BKD, LLP
Colorado Springs, Colorado
March 25, 2003

Statements of Financial Position

DECEMBER 31, 2002 AND 2001

ASSETS

	2002	2001
Cash	**$ 444,068**	$ 465,485
Accounts receivable	**261,569**	89,549
Accounts receivable, related party	**32,203**	—
Investments	**1,822,333**	2,292,260
Contributions receivable	**71,334**	109,372
Contributions receivable, related party	**31,000**	6,895
Prepaid expenses and other	**13,079**	14,081
Property and equipment, net	**120,540**	339,937
Total assets	**$ 2,796,126**	$ 3,317,579

LIABILITIES AND NET ASSETS

Accounts payable	**$ 46,223**	$ 118,690
Accrued expenses	**57,827**	130,752
Total liabilities	**104,050**	249,442
Net Assets		
Unrestricted	**2,233,119**	2,775,032
Temporarily restricted	**458,957**	293,105
Total net assets	**2,692,076**	3,068,137
Total liabilities and net assets	**$ 2,796,126**	$ 3,317,579

See Notes to Financial Statements

Statements of Activities

YEAR ENDED DECEMBER 31, 2002

	Unrestricted	Temporarily Restricted	Total
REVENUES, GAINS AND OTHER SUPPORT			
Corporate partner support	$ 902,750	$ 115,400	$ 1,018,150
Contributions	702,237	368,533	1,070,770
Grants	41,500	105,137	146,637
Fundraising events, net of $71,378 of expenses	31,324	—	31,324
Fellows and other meetings	59,827	—	59,827
Video income	11,239	—	11,239
Other income	10,967	—	10,967
Net assets released from restrictions	423,218	(423,218)	0
Total revenues, gains and other support	2,183,062	165,852	2,348,914
EXPENSES			
Biomechanics research program	369,459	—	369,459
Basic science program	166,798	—	166,798
Clinical research program	334,455	—	334,455
Education program	362,601	—	362,601
Visual services	166,604	—	166,604
Technology development	68,472	—	68,472
Management and general	534,291	—	534,291
Fundraising	456,226	—	453,226
Total expenses	2,458,906	—	2,458,906
OTHER INCOME			
Investment loss	(266,069)	—	(266,069)
CHANGE IN NET ASSETS	(541,913)	165,852	(376,061)
NET ASSETS, BEGINNING OF YEAR	2,775,032	293,105	3,068,137
NET ASSETS, END OF YEAR	$ 2,233,119	$ 458,957	$ 2,692,076

See Notes to Financial Statements

Statements of Activities

YEAR ENDED DECEMBER 31, 2001

	Unrestricted	Temporarily Restricted	Total
REVENUES, GAINS AND OTHER SUPPORT			
Corporate partner support	$ 1,105,179	$ 100,000	$ 1,205,179
Contributions	757,536	252,076	1,009,612
Grants	96,000	—	96,000
Fundraising events, net of $216,030 of expenses	269,943	—	269,943
Fellows and other meetings	19,500	—	19,500
Video income	14,859	—	14,859
Other income	31,602	—	31,602
Net assets released from restrictions	364,449	(364,449)	0
Total revenues, gains and other support	2,659,068	(12,373)	2,646,695
EXPENSES			
Biomechanics research program	456,927	—	456,927
Basic science program	421,975	—	421,975
Clinical research program	420,721	—	420,721
Education program	347,655	—	347,655
Visual services	175,102	—	175,102
Technology development	143,918	—	143,918
Management and general	399,587	—	399,587
Fundraising	411,227	—	411,227
Total expenses	2,777,112	—	2,777,112
OTHER INCOME			
Investment loss	(145,307)	—	(145,307)
CHANGE IN NET ASSETS	(263,351)	(12,373)	(275,724)
NET ASSETS, BEGINNING OF YEAR	3,038,383	305,478	3,343,861
NET ASSETS, END OF YEAR	$ 2,775,032	$ 293,105	$ 3,068,137

See Notes to Financial Statements

Statements of Cash Flows

YEARS ENDED DECEMBER 31, 2002 AND 2001

	2002	2001
OPERATING ACTIVITIES		
Change in net assets	**$ (376,061)**	$ (275,724)
Items not requiring (providing) cash		
Depreciation	**221,256**	242,852
Realized and unrealized losses on investments	**291,672**	187,194
Loss on disposal of fixed assets	**—**	1,197
In-kind contributions of investments	**(151,800)**	(263,237)
Changes in		
Accounts receivable, net	**(204,223)**	31,015
Contributions receivable, net	**13,933**	90,333
Prepaid expenses	**1,002**	17,423
Accounts payable	**(72,467)**	(97,155)
Accrued expenses	**(72,925)**	61,403
Deferred revenue	**—**	(129,429)
Net cash used in operating activities	**(349,613)**	(134,128)
INVESTING ACTIVITIES		
Purchase of property and equipment	**(1,859)**	(41,351)
Purchases of investments	**(89,266)**	(2,122,822)
Sales of investments	**419,321**	2,290,343
Net cash provided by investing activities	**328,196**	126,170
DECREASE IN CASH	**(21,417)**	(7,958)
CASH, BEGINNING OF YEAR	**465,485**	473,443
CASH, END OF YEAR	**$ 444,068**	$ 465,485

See Notes to Financial Statements

Statements of Functional Expenses

YEAR ENDED DECEMBER 31, 2002

	Programs									
	Biomechanics Research	Basic Science	Clinical Research	Education	Video Services	Technology Development	Total	Management and General	Fundraising	Total
Salary and benefits	$263,834	$24,558	$210,604	$61,242	$111,997	$41,998	$714,233	$ 211,923	$ 170,414	$ 1,096,570
Payroll taxes	17,730	1,519	14,009	5,654	7,497	1,321	47,730	5,363	10,504	63,597
Entertainment	250	673	53	24,479	—	—	25,455	1,890	36,616	63,961
Travel	12,130	3,162	2,257	55,654	5,129	810	79,142	74,425	7,764	161,331
Utilities	8,236	3,753	—	816	1,969	1,189	15,963	2,974	1,538	20,475
Telephone	5,989	2,785	11,018	5,020	3,293	2,493	30,598	10,598	4,861	46,057
Consulting and contract labor	10,324	81,747	14,429	2,116	1,249	1,114	110,979	30,264	44,390	185,633
Legal and accounting	9,704	2,031	6,429	2,153	1,255	1,144	22,716	2,906	10,883	36,505
Postage and freight	1,266	675	5,723	1,409	1,178	86	10,337	1,832	6,894	19,063
Exhibits and meetings	3,442	500	315	103,606	—	—	107,863	35	67	107,965
Research projects	(979)	—	(496)	50,433	—	—	48,958	—	—	48,958
Facility rent	8,031	4,002	26,593	1,357	2,573	1,484	44,040	7,214	2,656	53,910
Promotion	27	54	27	372	27	27	534	685	67,495	68,714
Repair, maintenance and equipment	7,212	4,118	16,971	8,909	4,809	1,846	43,865	5,898	4,082	53,845
Board and SAC meeting	—	—	—	7,608	—	—	7,608	3,382	7,634	18,624
Dues, subscriptions, books and journals	1,106	82	50	5,386	—	58	6,682	164	1,203	8,049
General insurance	—	—	—	—	—	—	—	27,247	250	27,497
Printing	4,202	452	6,072	6,567	1,421	735	19,449	5,611	36,398	61,458
Supplies	3,200	6,636	5,447	990	2,577	2,069	20,919	8,096	5,470	34,485
Program support	248	85	263	13,711	239	160	14,706	—	7,596	22,302
Depreciation	13,123	29,879	10,147	4,493	21,372	11,892	90,906	126,194	4,156	221,256
Other	384	87	4,544	626	19	46	5,706	7,590	25,355	38,651
	$369,459	$166,798	$334,455	$362,601	$166,604	$68,472	$1,468,389	$534,291	$456,226	$2,458,906

Statements of Functional Expenses

YEAR ENDED DECEMBER 31, 2001

Programs	Biomechanics Research	Basic Science	Clinical Research	Education	Video Services	Technology Development	Total	Management and General	Fundraising	Total
Salary and benefits	$313,645	$42,945	$266,441	$161,456	$124,435	$106,114	$1,015,036	$141,792	$ 189,151	$1,345,979
Payroll taxes	19,969	2,105	19,296	9,695	7,894	6,902	65,861	6,174	12,212	84,247
Entertainment	2,201	1,446	2,709	15,559	1,074	372	23,361	5,514	(693)	28,182
Travel	10,323	3,200	6,451	2,671	1,110	1,075	24,830	13,345	4,888	43,063
Utilities	8,119	3,837	—	937	1,983	1,232	16,108	1,750	1,382	19,240
Telephone	4,671	2,390	9,791	2,207	2,056	2,332	23,447	8,358	2,846	34,651
Consulting and contract labor	8,153	74,431	22,426	—	—	645	105,655	36,000	47,441	189,096
Legal and accounting	4,992	1,703	5,148	1,799	853	1,103	15,598	2,710	6,488	24,796
Postage and freight	2,018	781	2,888	1,351	1,173	108	8,319	1,738	3,605	13,662
Exhibits and meetings	1,970	15	1,010	101,670	—	120	104,785	630	601	106,016
Grants	—	130,000	—	—	—	—	130,000	—	—	130,000
Research projects	11,918	49,827	4,871	1,890	—	—	68,506	—	—	68,506
Facility rent	14,648	7,069	39,159	1,936	3,787	2,457	69,056	11,640	3,945	84,641
Promotion	482	—	504	307	307	110	1,710	755	80,302	82,767
Repair, maintenance and equipment	12,019	4,268	8,147	2,582	4,740	1,844	33,600	4,571	5,862	44,033
Board and SAC meeting	—	—	—	—	—	—	—	17,893	196	18,089
Dues, subscriptions, books and journals	2,388	250	576	5,693	—	668	9,575	543	1,252	11,370
General insurance	3,354	1,202	3,147	1,083	587	575	9,948	9,144	1,597	20,689
Printing	595	347	4,344	485	350	75	6,196	1,376	26,354	33,926
Supplies	6,663	35,624	9,386	1,737	4,368	1,399	59,177	3,268	7,493	69,938
Program support	13	30,080	225	26,614	117	—	57,049	—	10,635	67,684
Depreciation	28,646	30,321	11,465	4,517	20,169	16,699	111,817	126,549	4,486	242,852
Other	140	134	2,737	3,466	99	88	6,664	5,837	1,184	13,685
	$456,927	$421,975	$420,721	$347,655	$175,102	$143,918	$1,966,298	$399,587	$411,227	$2,777,112

Notes to Financial Statements

YEARS ENDED DECEMBER 31, 2002 AND 2001

NATURE OF OPERATIONS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Nature of Operations
Steadman◆Hawkins Sports Medicine Foundation (the Foundation) is a not-for-profit foundation located in Vail, Colorado that is organized for educational and scientific purposes to advance medical science and research.

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

Gifts of land, buildings, equipment and other long-lived assets are reported as unrestricted revenue and net assets unless explicit donor stipulations specify how such assets must be used in which case the gifts are reported as temporarily or permanently restricted revenue and net assets. Absent explicit donor stipulations for the time 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. 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.

Corporate Partners
The Foundation has agreements with several corporations where the Foundation's research and product development is provided to the corporation in exchange for an annual payment to the Foundation. These agreements are recorded as income in the year payment is due.

Cash
At December 31, 2002, the Foundation's cash accounts exceeded federally insured limits by approximately $265,500.

Accounts Receivable
Accounts receivable are stated at the amount billed to customers. The Foundation provides an allowance for doubtful accounts, which is based upon a review of outstanding receivables, historical collection information and existing economic conditions. Accounts receivable are ordinarily due 30 days after the issuance of the invoice. Accounts past due more than 120 days are considered delinquent. Delinquent receivables are written off based on individual credit evaluation and specific circumstances of the customer.

Property and Equipment
Property and equipment are depreciated over the estimated useful life of each asset. Leasehold improvements are depreciated over the shorter of the lease term plus renewal options or the estimated useful lives of the improvements.

Investments and Investment Return
Investments in equity securities having a readily determinable fair value and all debt securities are carried at fair value. Investment return includes dividend, interest and other investment income and realized and unrealized gains and losses on investments carried at fair value. Investment return is reflected in the statements of activities as unrestricted or temporarily restricted based upon the existence and nature of any donor or legally imposed restrictions.

Use of Estimates
The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues, expenses, gains, losses and other changes in net assets during the reporting period. Actual results could differ from those estimates.

Income Taxes
The Foundation is a qualifying organization under Section 501(c)(3) of the Internal Revenue Code and a similar provision of state law. Consequently, no provision for income taxes has been made in the financial statements.

Reclassifications
Certain reclassifications have been made to the 2001 financial statements to conform with the 2002 financial statement presentation. These reclassifications had no effect on the change in net assets.

INVESTMENTS AND INVESTMENT RETURN
Investments at December 31 consist of the following:

	2002	2001
Stock and equity funds	$ 882,811	$ 1,020,170
Equity securities	471,614	606,604
Fixed income funds	414,255	388,743
Money market funds	53,653	176,743
Certificates of deposit	—	100,000
	$ 1,822,333	$ 2,292,260

At December 31, 2002 and 2001, approximately 74% and 71%, respectively, of the Foundation's investments consisted of equity securities and equity mutual funds.

Investment return during 2002 and 2001 consists of the following:

	2002	2001
Interest and dividend income	**$ 25,603**	$ 41,887
Net realized and unrealized loss on investments	**(291,672)**	(187,194)
Investment income	**$ (266,069)**	$ (145,307)

CONTRIBUTIONS RECEIVABLE

Contributions receivable at December 31 are due as follows:

	2002	2001
Due in less than one year	**$ 79,200**	$ 71,995
Due in one to five years	**25,000**	50,000
	104,200	121,995
Less unamortized discount	**(1,866)**	(5,728)
Due from related parties	**(31,000)**	(6,895)
	$ 71,334	$ 109,372

Approximately 48% and 57% of total contributions receivable at December 31, 2002 and 2001, respectively, are from one donor. The Foundation receives support and pledges from members of the Board of Directors and employees. These pledges receivable are included in contributions receivable, related party.

PROPERTY AND EQUIPMENT

Property and equipment at December 31 consists of the following:

	2002	2001
Equipment	**$ 1,426,439**	$ 1,424,280
Furniture and fixtures	**45,984**	45,984
Leasehold improvements	**731,780**	731,781
	2,204,203	2,202,045
Less accumulated depreciation	**2,083,663**	1,862,108
	$ 120,540	$ 339,937

TEMPORARILY RESTRICTED NET ASSETS

Temporarily restricted net assets at December 31 are available for the following purposes:

	2002	2001
Biomechanics research	**$ 230,368**	$ 18,483
Education	**104,541**	63,058
Unrestricted contributions receivable	**102,334**	116,267
Basic science	**21,714**	39,247
Clinical research	**—**	56,050
	$458,957	$293,105

RELEASE OF TEMPORARILY RESTRICTED NET ASSETS

Net assets were released from donor restrictions by incurring expenses satisfying the restricted purposes or by occurrence of other events specified by donors as follows:

	2002	2001
Purpose restrictions accomplished		
Education	**$ 245,416**	$ 145,689
Clinical research	**57,250**	—
Biomechanics research	**41,614**	58,927
Basic science programs	**19,000**	—
	363,280	204,616
Time restrictions expired		
Collection of contributions receivable	**59,938**	159,833
Total restrictions released	**$423,218**	$ 364,449

OPERATING LEASES

Noncancellable operating leases for property and equipment expire in various years through 2005. One of the property leases requires the Foundation to pay all executory costs (property taxes, maintenance and insurance).

Future minimum lease payments at December 31, 2002 are:

2003	$68,530
2004	62,622
2005	58,318
2006	57,300
2007	57,300
	$304,070

Rental expense of $115,661 and $107,062 for the years ended December 31, 2002 and 2001, respectively, is recorded in the statements of activities.

SALARY DEFERRAL

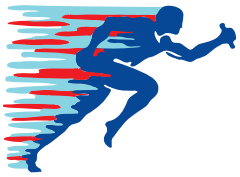
The Foundation has a defined contribution pension plan under IRS Section 401(k). The plan is open to all employees with at least six months of employment. The Foundation's contributions to the plan are determined annually. The Foundation elected to match 50% of participants' contributions up to 6% during 2002 and 2001. Under this formula, the Foundation made contributions of $19,147 and $24,824 for the years ended December 31, 2002 and 2001, respectively.

SIGNIFICANT ESTIMATES AND CONCENTRATIONS

Accounting principles generally accepted in the United States of America require disclosure of certain significant estimates and current vulnerabilities due to certain concentrations. Those matters include the following:

CORPORATE PARTNERS

During 2002 and 2001, approximately 59% and 73%, respectively, of all corporate partner support was received from 3 and 4 partners, respectively.



Steadman◆Hawkins Sports Medicine Foundation

A 501(c)(3) nonprofit organization

181 WEST MEADOW DRIVE, SUITE 1000
VAIL, COLORADO 81657
970-479-9797
FAX: 970-479-9753

http://www.shsmf.org