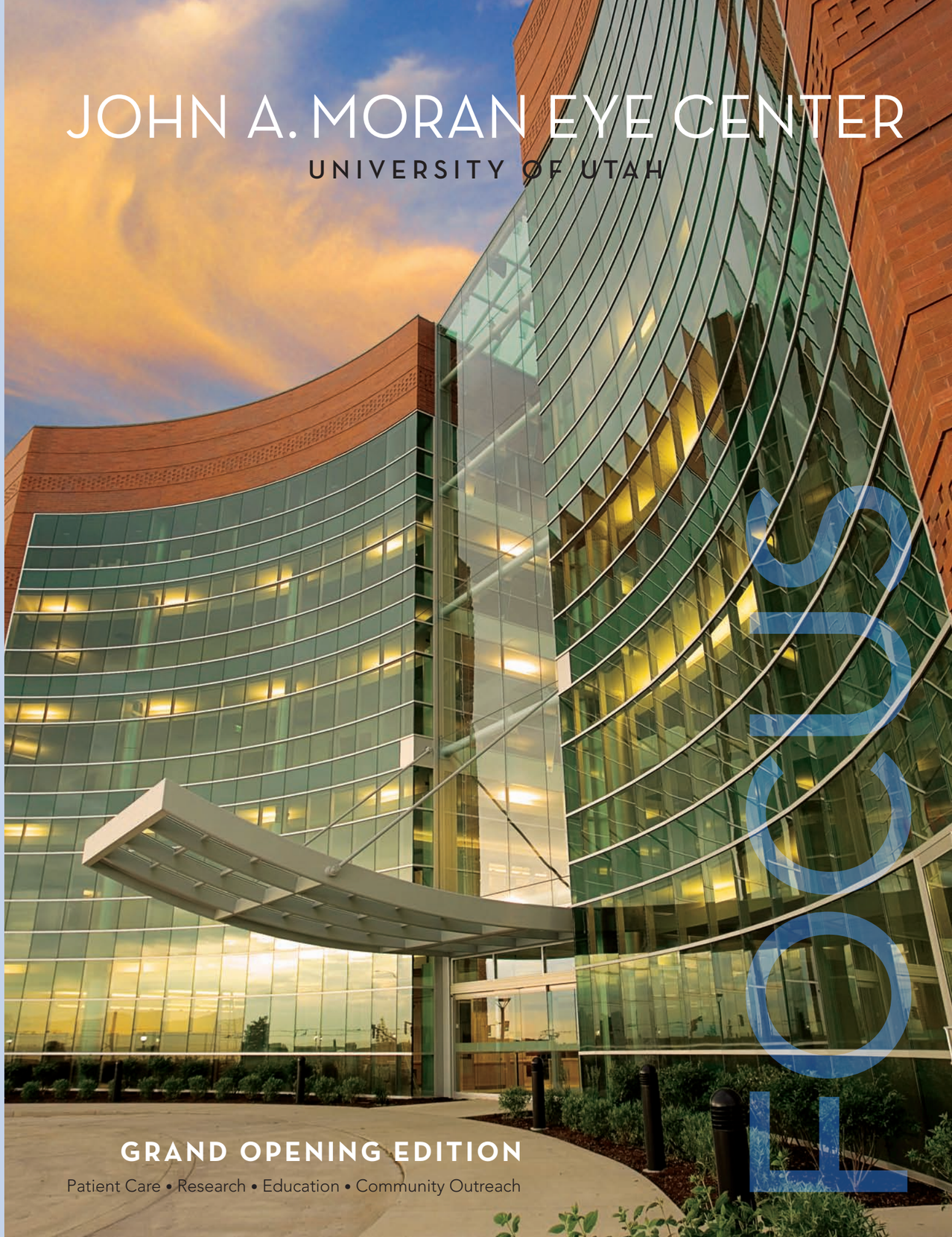
The University of Utah
Moran Eye Center

JOHN A. MORAN EYE CENTER

GRAND OPENING EDITION • 2006



JOHN A. MORAN EYE CENTER

UNIVERSITY OF UTAH

GRAND OPENING EDITION

Patient Care • Research • Education • Community Outreach

SCOPE

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Vision

The Moran Eye Center is committed to the goal that no person with a blinding condition, eye disease or visual impairment should be without hope, understanding and treatment.

FOCUS

Official Publication of the Moran Eye Center at the University of Utah

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Requests for additional copies of this publication may be sent to:

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Salt Lake City, UT 84132

For more information about the Moran Eye Center, visit our Web site at: www.moraneyecenter.org

Mission

We dedicate ourselves to serve the visually impaired through Patient Care, Research, Education, and Community Outreach, and to create a legacy upon which future generations can continue to build.

The John A. Moran Eye Center Advisory Board

Our community, our students, our employees, and our patients are grateful for the hard work, vision, and dedication of the John A. Moran Eye Center Advisory Board

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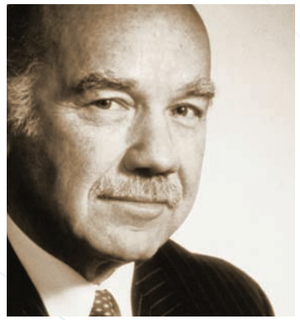


John A. Moran

BELIEF AND VISION

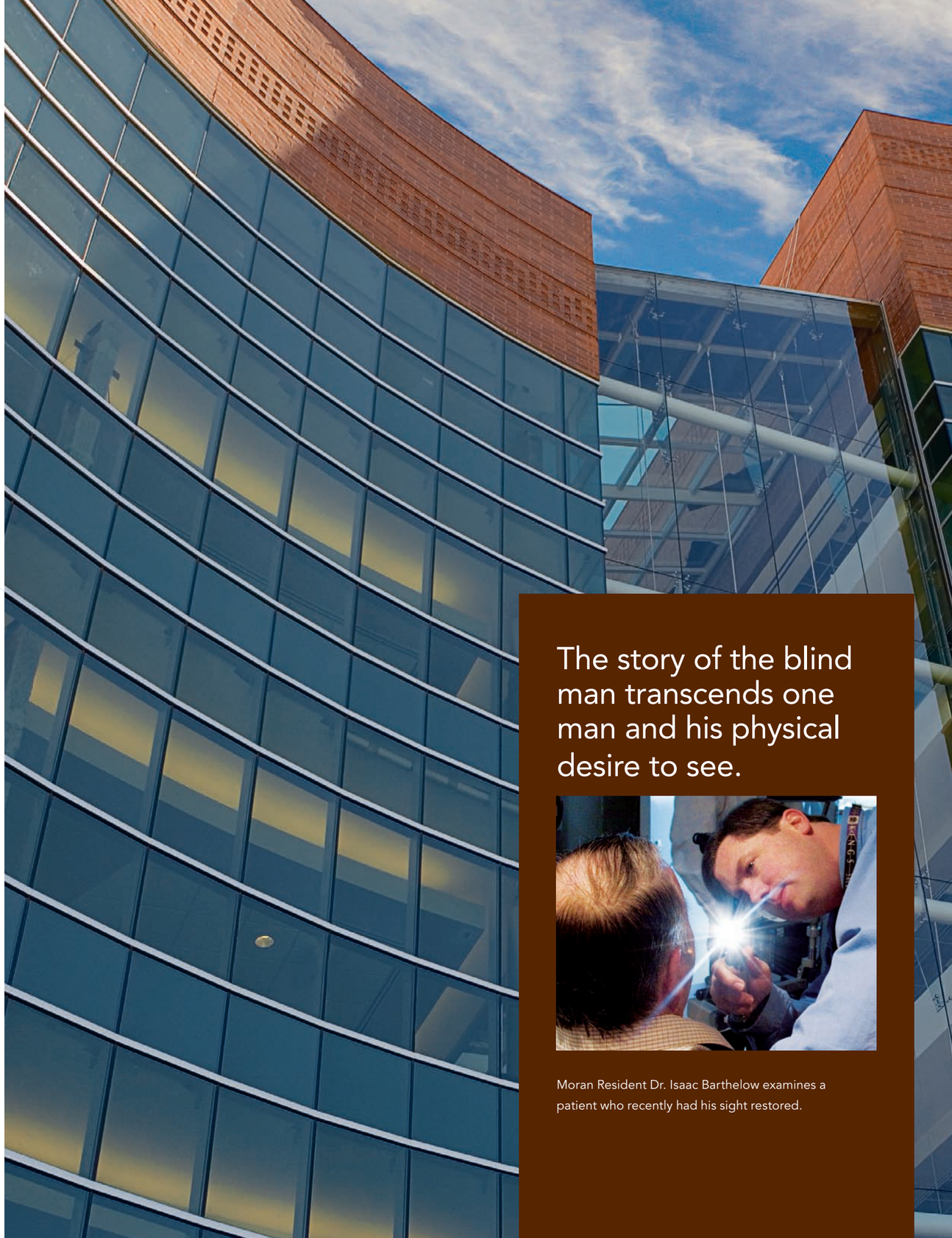
"One of the reasons this building exists is because my mother planted within me a belief in miracles."

The new Moran Eye Center

As I contemplate this beautiful new building created to provide eye care research and education on diseases of the eye, I hope there are mothers in the world today teaching their sons or daughters about believing in miracles. When Dr. Olson told me about his dream to carry out research that might someday restore vision to the blind, it brought to my mind stories from the Bible that my mother had read to me as a child. As a little boy, I was particularly touched by the story of the blind beggar, the power of faith, and the miraculous restoration of his sight. One of the reasons this building exists is because my mother planted within me a belief in miracles. I'm reminded of the words of Helen Keller who said: "The only thing worse than being blind is having sight but no vision." Even today, these many decades later, my vision of life's possibilities is influenced by my mother's love.

The story of the blind man transcends one man and his dream and hope for vision. It reminds us that as individuals we must never give up hope that we can accomplish things that were previously considered impossible. That irresistible sense of hope that exists in each of us can be felt in this new building, and in the hearts of those who will be caring for patients, and for those who are working to advance the science of human sight.

There are marvelous new discoveries to be made in the science of eye care. I'm confident that the dedicated doctors, scientists, educators and their colleagues at the new Moran Eye Center will uncover many of these mysteries and develop cures for blinding eye diseases. My heartfelt thanks go out to all who have shared my belief and vision and have helped make this wonderful building a reality.



The story of the blind man transcends one man and his physical desire to see.

Moran Resident Dr. Isaac Barthelow examines a patient who recently had his sight restored.

Randall J Olson, M.D.
The John A. Moran Presidential Professor
Chair of Ophthalmology and Visual Sciences
CEO, John A. Moran Eye Center

Journey

Mrs. Larson pinned a note on my shirt that read, "Dear Mrs. Olson, Randy needs to have his eyes checked!"

Wasatch Elementary School, as seen from the 5th floor of the new Moran Eye Center.

From my office on the fifth floor of the new Moran Eye Center on the University of Utah campus, I can see my earliest alma mater, Wasatch Elementary School. The physical distance between my childhood environs and the new Moran Eye Center is short, but the journey has been a long and fascinating path.

About a half a century ago my first-grade teacher at Wasatch, Mrs. Larson, pinned a note on my shirt that read, "Dear Mrs. Olson, Randy needs to have his eyes checked!" I had been assigned a back-row seat, and I remember asking Mrs. Larson, "Could you write a little bigger, because I can't see."

Seemingly inconsequential moments like that often have great implications in the course of our lives. When I got my glasses, I distinctly remember seeing the beautiful details in autumn leaves for the first time in my life. It was an experience that touched me deeply—one I've never forgotten.

The new Moran Eye Center is a focusing point for our mission, which is that no one suffering from a blinding condition should be without hope, understanding and treatment. Once dispersed throughout the University of Utah Campus in a half dozen buildings, we have gathered our researchers together in this amazing new building to carry out synergistic scientific research and clinical trials. We believe this effort will literally help bring sight to those who cannot see.

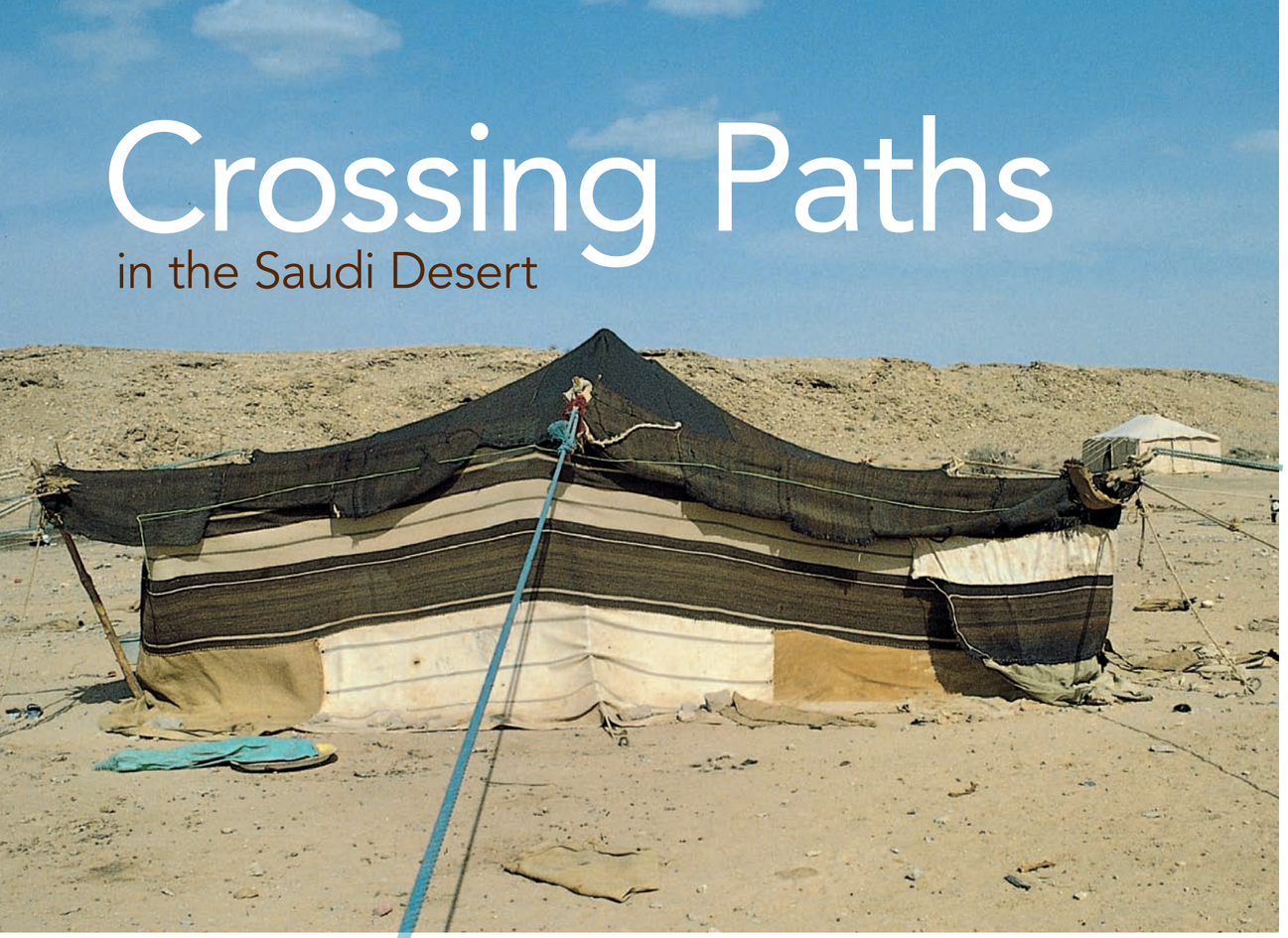
In our new building, five bridges lead from the research laboratories directly to our patient care areas. The bridges are infused with the sun's natural light as it shines through the atrium. This is a fitting symbol of our sincere hope that the fruits of our research will bring light to the lives of those who live in partial or full darkness.

To those who have so generously donated to this wonderful structure, I thank you. To those who come into our care, we welcome you and promise to do all we can to restore and improve your sight.

P.S. Thank you Mrs. Larson.

Five bridges lead from the research laboratories directly to our patient care areas. The bridges are infused with the sun's natural light as it shines through the atrium. This is a fitting symbol of our sincere hope that the fruits of our research will bring light to the lives of those who live in partial or full darkness.

Crossing Paths
in the Saudi Desert



Above: Close up of Saudi tent from the outside.

Right: Dr. Randy Olson

It's not by chance that the John A. Moran Eye Center is an international center for excellence. The Center's top two leaders have experienced worldwide service far beyond the boundaries of the United States. Through a connection that today feels a lot like destiny, their paths crossed deep in the remote deserts of Saudi Arabia more than 20 years ago.

In 1984 a young ophthalmologist from Utah, Dr. Randall Olson, was serving as the medical director of the King Khaled Eye Specialist Hospital in Riyadh, Saudi Arabia. Dr. Olson was also working as a clinical professor of ophthalmology at King Saud University, a position he held from 1984-86.

As director of the hospital in Riyadh, Dr. Olson was presented with many unique "opportunities." When the king of Saudi Arabia asked Dr. Olson to treat Libyan dictator Muammar al-Qaddafi, Dr. Olson hesitated. He recalls thinking, "Well, I'm a physician, and life's short. It might be an interesting experience." The Libyan dictator never made it to Dr. Olson's surgical table because the two leaders insulted one another on the tarmac, with Qaddafi abruptly departing in his private jet. Dr. Olson remembers another time when the Ugandan dictator Idi Amin wanted him to operate on his eyes. He said to the king, "This is really hard for me. Can't you get anyone else?" Fortunately for Dr. Olson, he did.

Remote camp in Saudi Arabia where Wayne and Randy first met.

Wayne Imbrescia was camped in the remote deserts of Saudi Arabia with a convoy of 40 people, on an extended expedition chronicling the prevalence of eye disease in that country.

Dr. Olson did honor the king's request to perform cataract surgery on his stepmother. He remembers the event well. "I counted 86 people lined up outside the operating room as she was being wheeled in. Fifteen physicians were watching me, staring, just waiting for me to make a slip. I was 38 years old. I said to myself, 'Olson, you can do it.' Challenges haven't worried me since," he says.

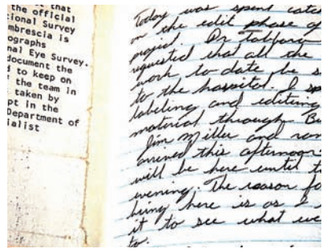
Wayne Imbrescia

On April 3, 1984, Wayne Imbrescia, a young man from Montana, was camped in the remote deserts of Saudi Arabia with a convoy of 40 people. They were on an extended expedition chronicling the prevalence of eye disease in that country. Wayne was carrying a personal pass from King Fahd that authorized him to photographically document the mission. He has the distinction of being one of the first to use portable computers to record epidemiological studies in that part of the world. The so-called lap tops weighed 25 pounds, and since hard drives had not yet been invented, the computers recorded the information on micro cassettes.

That hot April day Wayne wrote the following in his journal, "...Randy Olson arrived this afternoon. They will be here until tomorrow evening. The reason for them being here, as I understand it, is to see what we are up to."

Data collection in the desert.

Tuesday, April 3, 1984: "Jim Miller and Randy Olson arrived this afternoon. They will be here until tomorrow evening. The reason for them being here, as I understand it, is to see what we are up to."



Wayne's journal from Saudi Arabia.

Neither Wayne nor Randy could have dreamed that more than two decades later Randy would still be observing what Wayne is up to. Today Wayne is the executive director and Randy the CEO of the John A. Moran Eye Center. Their journey has led them to oversee a world-class eye center consisting of more than 40 internationally renowned physicians and researchers, and more than 400 employees serving over 100,000 patients annually.

THE FIRST
Moran Eye Center

HUMBLE BEGINNINGS

Any history of the Department of Ophthalmology and Visual Sciences at the University of Utah and the John A. Moran Eye Center begins with, and today continues with, Dr. Randy Olson. In 1979 the Division of Ophthalmology was a one-person operation, consisting of Randall J Olson, M.D. In 1982 the division was accorded departmental status and a year later Dr. Olson was selected as chairman of the department. To this day he retains his position as chairman of the Department of Ophthalmology and Visual Sciences. In addition, he is the John A. Moran Presidential Professor and CEO of the Moran Eye Center.

The Division of Ophthalmology has undergone incredible growth since Dr. Olson was recruited to spearhead its development. Just three years after his appointment as chair of the department, Dr. Olson was looking forward to the construction of an eye center at the University of Utah.

The opening of the first John A. Moran Eye Center marked the beginning of a new era for the patients and patrons of the University of Utah School of Medicine's Department of Ophthalmology and Visual Sciences.

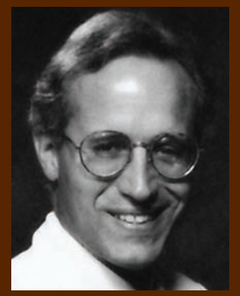
A DREAM BECOMES A REALITY

The vision for the first Moran Eye Center became a reality as the result of a generous $3.5 million donation from University of Utah alumnus John Moran, coupled with many other gifts from patients, friends, donors and organizations. Through this outpouring of philanthropy, the Department of Ophthalmology and Visual Sciences was able to move into the center in 1993. The opening of the first John A. Moran Eye Center marked the beginning of a new era for the patients and patrons of the University of Utah School of Medicine's Department of Ophthalmology and Visual Sciences. For 13 years the 85,000-square-foot facility was a growing hub for vision research, education, community outreach and cutting-edge ophthalmic care.

Within a decade it became obvious that more space was needed to accommodate the dynamic growth of the Moran Eye Center. As research and patient care expanded, temporary sheds were built for laboratories, and researchers were relocated throughout the University of Utah campus.

The lack of research space at the center became critical. In such a diffused environment, it was difficult to maintain the synergy needed for collaborative research initiatives. Combining members of the research team into one facility became an important objective.

THE FIRST MORAN EYE CENTER



Dr. Olson early in his career.

First Moran Eye Center ground breaking.

Excavation for the First Moran Eye Center.

Foundation for the first Moran Eye Center.

Construction of the First Moran Eye Center.

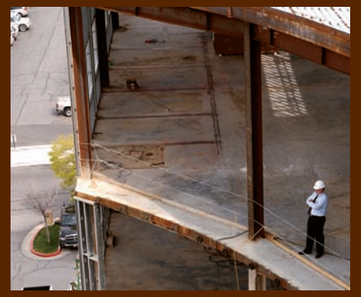
First Moran Eye Center completed.

The new facility more than triples the amount of laboratory space available and will house all of our vision research teams in the same building.

UNPRECEDENTED GROWTH

Recognizing the need for more space, Dr. Olson began a drive to build a new eye center just ten years after the first Moran building was constructed. The Moran Eye Center Campaign for Vision successfully raised $36 million thanks to our generous donors and friends, including an $18 million gift from John Moran. Additional funds were provided by the institution to fund the construction of the new $54 million, 210,000 square-foot research, clinical and surgical facility. The new facility replaces the original Moran Eye Center, which will be used to house other selected departments of the University of Utah Health Sciences Center.

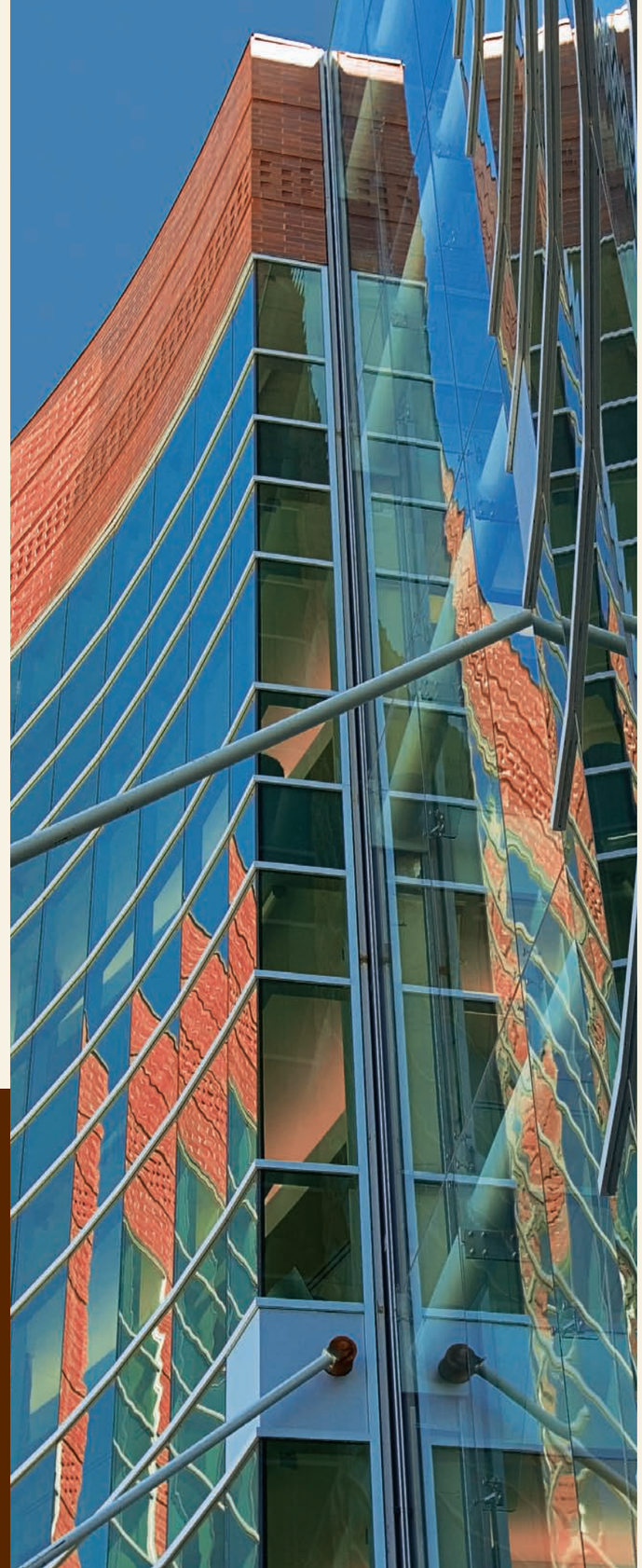
Ground breaking for the new John A. Moran Eye Center took place on April 19, 2004. The weather was cold but the ceremony was memorable. Local dignitaries, friends, donors, patients and staff attended. The new facility more than triples the amount of laboratory space as compared to the first Moran Eye Center, and will house all of our vision research teams in the same building. With some of the world's best and brightest researchers working at the new facility, the ability to leverage both research funding and diverse knowledge increases exponentially, due to the sharing of equipment, ideas and discoveries. In turn, this dramatically increases our ability to transition treatments for preventing or curing blinding eye disease from the laboratories to the clinic.

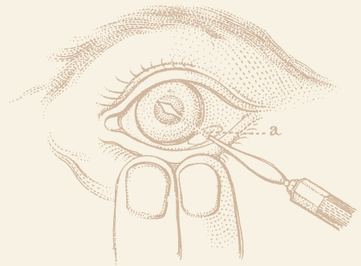


Wayne Imbrescia, Executive Director, viewing Salt Lake from construction site.

The framework of the New Moran Eye Center.

New Moran Eye Center near completion.





You'll See

To look again on a beloved face,
To trace the glory of the setting sun–
Visual wonders teem in every place
To be perceived and treasured, every one.
Skilled hands can resurrect a priceless joy,
Their dedicated work prolonging sight.
Where endless darkness threatens, they employ
The art of restoration to the light.
Noble physicians, traveling the Earth
To bring the gift of healing, may they know
Their boundless efforts magnify their worth–
With scientific giant steps they grow.
They liberate their purpose, setting free
The promise of those blessed words,
You'll See!

By Marlene D. Pinkney
(dedicated to the physicians and staff of the Moran Eye Center)

THE NEW

MORAN EYE CENTER

A NEW DREAM, A NEW REALITY

Today the new John A. Moran Eye Center is the largest eye care and vision research center between Texas and the West Coast. Employees throughout the Moran organization are committed to world-class patient care, research, education, and community outreach programs that bring hope to those suffering from blinding or vision impairing conditions.

The Moran Eye Center now offers twelve locations along Utah's Wasatch Front, making university ophthalmologists more accessible to patients. The additional clinics have allowed Moran physicians to see more patients, which in turn has led to more referrals to the center for specialty care.

Last year the center and its satellite clinics hosted more than 100,000 patient visits, compared to 32,500 in 1993. Nearly 5,000 surgeries were performed in the center's four surgical suites this year, compared to 2,300 in 1993.

As the only medical school in the Mountain West, the University of Utah plays an important role in training the region's next generation of physicians. Each year the Moran Eye Center provides ophthalmology training to more than 150 medical students, as well as three interns, five fellows and six international fellows. The Moran Eye Center's residency program is ranked in the top 10 in the nation.

The Moran Eye Center is now home to more than 40 faculty members, including one of the top retinal research teams in the world. In 1993 there were only 26 faculty members. Moran researchers are involved in more than 35 active clinical trials, compared to three in 1993. These studies involve more than 3,000 clinical visits each year. The Moran Eye Center's annual research grants from the National Institutes of Health exceeded $6.5 million dollars in 2005, placing it eighth in the nation for NIH grants.

The left side of the new Moran Eye Center is a 5 story pavilion for patient care, increasing clinic space by 40%. The 6 story pavilion on the right will triple research space.

"Our long-term goal—which is beyond my time—is to be the premier ophthalmic institution in the world. I want to have a self-sufficient endowment to meet core research needs before I retire. That will be my legacy."

—Dr. Randy Olson

Research space in the new Moran Eye Center is truly state-of-the-art. Dr. Khang Zang and fellow researchers carry out research with the new equipment in the Zang Laboratory.

Research Director Dr. Robert Marc requested entire walls made of white board in the new Marc Laboratory. Here he enjoys a teaching moment with his colleagues.

THE NEW

MORAN EYE CENTER

THE VISION OF ART AND THE ART OF VISION

John and Toni Bloomberg

Imagine giving a large gift to a charitable organization. What would be your most important hope for that gift? At the Moran Eye Center we believe our donors deserve world-class stewardship for every gift they give.

Stewardship is the process of acknowledging, managing and reporting charitable gifts after they are given. We believe our special donors expect us to manage and protect their gifts, ensuring that they will outlast their lifetime. This principle is illustrated by a generous gift from John and Toni Bloomberg to the Moran Eye Center.

The old cliché, "You don't appreciate what you have until it's gone," has special meaning for John and Toni Bloomberg. It is the reason for the couple's generosity to the Moran Eye Center. John Bloomberg almost lost his vision.

The vision loss prevented John from achieving his goals of becoming a ranked tennis player and skier in his age group. Simple things like reading The Wall Street Journal and driving at night become extremely difficult.

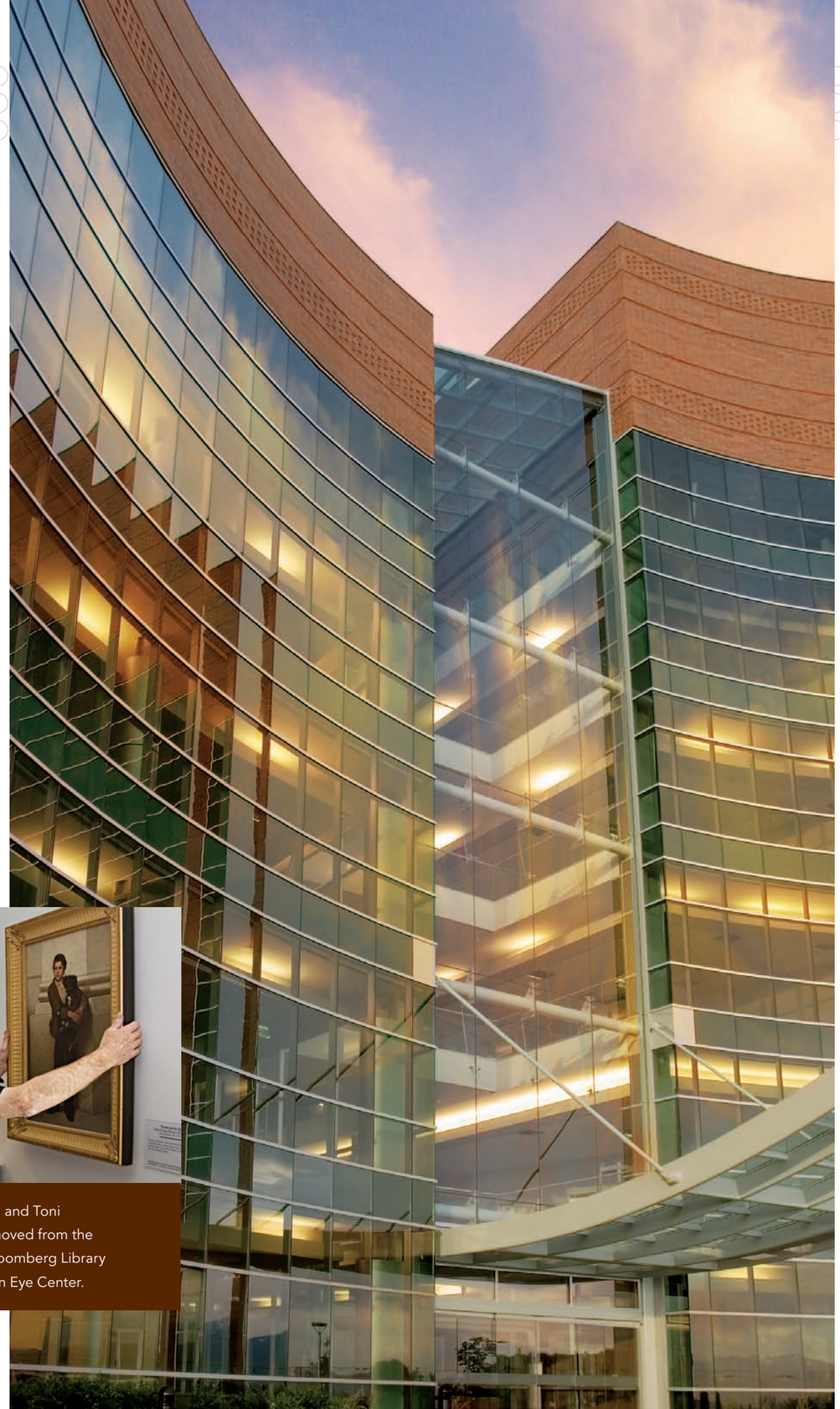
Following cataract surgery at the University of Utah by Dr. Randall J Olson, John Bloomberg's vision was restored. John won the U.S. Masters Nationals in his age group. The grateful couple tried to think of a fitting way to show their appreciation.

Toni remembers how the decision was made, "We thought, 'What better place for fine art than a center dedicated to restoring sight?'" As a result, all of the artwork in the John and Toni Bloomberg Library, and throughout the building, has been donated from the couple's collection of pieces by Utah artists. "Our hope is that through the work of these wonderful Utah artists, the patients, faculty, students and staff of the Moran Eye Center will continue to be inspired and appreciative of the tremendous gift of sight."

In the Moran spirit of steadfast stewardship, the artwork donated by the Bloombergs was carefully moved from the first Moran Eye Center and placed in the new and larger Bloomberg Library which they have also funded at the new Moran Eye Center.

This thoughtful gift is one of literally thousands of special donations we could spotlight. There are many donors who have made the new John A. Moran Eye Center possible. We are grateful to all those who funded this special place to work, do research, educate and serve patients and the community. We reaffirm our promise to properly steward each gift we receive.

The art donated by John and Toni Bloomberg is carefully moved from the old Moran to the new Bloomberg Library located in the new Moran Eye Center.



THE NEW

MORAN EYE CENTER

FACTS AND FIGURES

THE NEW MORAN EYE CENTER:

- Is the largest vision treatment and research center in the Intermountain West.
- Has attracted over 40 faculty members, including vision researchers and specialists who come from 10 different countries.
- Provides a graduate physician training program that is consistently ranked among the top 10 residency programs in the country.
- Is home to the Utah Lions Eye Bank, which provides donor tissue for vision-restoring corneal transplants to more than 400 recipients in Utah and Wyoming every year.
- Received more than $6.5 million from the National Institutes of Health to support vision research in 2005, eighth largest in the country. Additional support comes from private donors and revenue generated from clinical and surgical services.
- Less than 1 percent of the center's budget comes from the State of Utah.

THE NEW MORAN EYE CENTER BUILDING:

- Has more than 400,000 feet of data cabling for data transfer, network and telephones. This amounts to approximately 78 miles of cable.
- Is made of more than 18,500 cubic yards of concrete—the equivalent of a three-foot sidewalk from Salt Lake City to Logan, Utah.
- At times had 150 workers representing approximately 40 different contracting companies on the project.

- Has 1,781,300 pounds of reinforcing steel bar (rebar) in concrete. This is the equivalent weight of approximately 600 mid-size cars.

PATIENT CARE

The center's clinical faculty members are available to see patients with virtually any eye disorder.

Dr. Majid Moshirfar examining Salt Lake City attorney Greg Adams and his new implantable contact lenses.

What sets patient care at the John A. Moran Eye Center apart from other vision care options available today? To begin with, we have the largest team of highly skilled eye care specialists between Texas and California who can, if needed, collaborate to meet your eye care needs.

At the Moran Eye Center, it's not uncommon to see two or three prominent ophthalmology specialists in the same exam room with one patient. Where else would you find a retinal disease specialist consulting with a physician who is both a neuro-ophthalmologist and an oculoplastic and facial plastic surgeon, consulting with an ocular pathologist? You may never need these three physicians at the same time, but it's nice to know they're available for you. The center's clinical faculty members are available to see patients with virtually any eye disorder.

Our specialties include cornea and external eye disease, cataract, comprehensive ophthalmology, corneal disease and refractive surgery, LASIK, intra-ocular lenses, glaucoma, optometry and contact lens, uveitis and ocular infectious disease, ocular pathology, pediatric ophthalmology and adult strabismus, neuro-ophthalmology, oculoplastic and facial plastic surgery, retinal diseases and surgery, electrophysiology and a unique counseling program to help patients and their families cope with visual impairment.

Clinical care services at the John A. Moran Eye Center include three fully equipped operating rooms, 54 examination rooms, minor procedure rooms, laser suites, an optical shop, a pharmacy and the Utah Lions Eye Bank.

Corneal and External Eye Diseases

Picture of keratoconus with a corneal scar

SERVICES

Specialized evaluation and medical/surgical treatment in the following areas:

- Consultation in the medical management of all disorders of the cornea
- Consultation in the medical and surgical management of all disorders of the conjunctiva, iris and lens, especially complicated cataract and complications of cataract surgery
- External eye diseases
- Cataract
- Conjunctiva, iris and lens
- Ocular allergy

Moran's Corneal and External Eye Disease Specialists

Randall J Olson

Randall J Olson, M.D., is the CEO of the John A. Moran Eye Center. He is the author of more than 300 professional publications and a worldwide lecturer. Dr. Olson specializes in research dealing with intra-ocular lens complications, teleophthalmology and corneal transplantation techniques. He was selected as one of the 15 best cataract surgeons in the United States in a peer survey conducted by *Ophthalmology Times. Cataract and Refractive Surgery Today* named Dr. Olson as one of 50 international opinion leaders. He has appeared in the last three editions of Best Doctors in America.

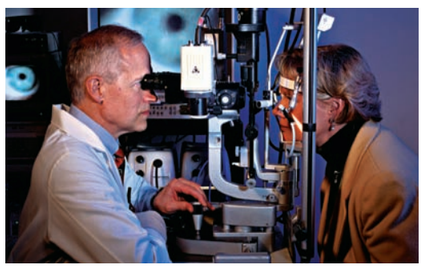
Time constraints limit the number of patients Dr. Olson is able to see, yet he continues to enjoy patient visits on a regular basis.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
Jules Stein Eye Institute, UCLA–Los Angeles, CA

FELLOWSHIP:
University of Pennsylvania–Philadelphia, PA; University of Florida–Gainesville, FL; LSU Eye Center–New Orleans, LA

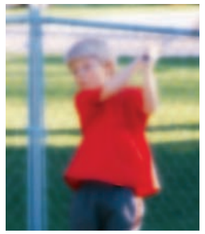
ACADEMIC APPOINTMENTS:
John A. Moran Presidential Professor; Chair Department of Ophthalmology and Visual Sciences–University of Utah School of Medicine



Dr. Olson examines one of his patients.

Cataract Services

Normal vision



Cataract

The Cataract Service at the Moran Eye Center at the University of Utah is dedicated to excellence in both the consultation and treatment of all types of cataracts. Our cataract surgeons use state-of-the-art equipment and have experience with complicated cataract cases. This helps ensure exacting diagnosis and best practices in medical and surgical care.

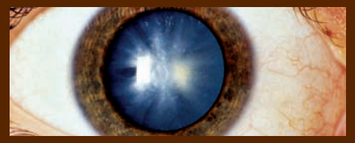
In addition, the Moran Eye Center is one of the leading centers worldwide in the evaluation of intra-ocular lenses which are placed in the eye following cataract surgery. We conduct ongoing basic and clinical research on new types of intra-ocular lenses, including lenses that will allow both near and distance vision as well as adjustable power lenses and lenses for exceptionally strong vision correction.

Dr. Jason Goldsmith and surgical technician Yohannes Dagne in surgery.

CATARACT SERVICES

- Consultation in medical and surgical treatment of all types of cataracts
- Cataract evaluation and treatment for all age groups including pediatric patients
- High risk or complicated cataracts
- Cataract surgery
- Consultation regarding all types of intra-ocular lens problems
- Consultation and surgical repair of traumatic injuries

What is a cataract?
A cataract is a clouding of the eye's lens that causes loss of vision.



What causes it?
The lens lies behind the iris and the pupil and adjusts the eye's focus. As we age, some of the protein in our eyes may clump together and start to cloud a small area of the lens.

When are you most likely to have a cataract?
People can have an age-related cataract in their 40s and 50s. But during middle age, most cataracts are small and do not affect vision. It is after age 60 that most cataracts steal vision.

What are its symptoms?
A cataract starts out small. You may notice that your vision is blurred a little, like looking through a cloudy piece of glass. You may also notice when you drive at night that the oncoming headlights cause more glare than before.

How is a cataract detected?
The only way to know for sure is by having an eye examination.

How is a cataract treated?
It is treated with surgery. Your eye care professional will remove your clouded lens and, in most cases, replace it with a clear plastic lens.

What can you do to protect your vision?
If you are over age 60, you should have an eye examination at least once every two years. This exam should include dilating your pupils. If you have a family history of an eye disease, perhaps a yearly examination is indicated. Wear UV protective sunglasses.

Moran's Cataract Specialists

Alan S. Crandall

Jason Goldsmith

Bradley J. Katz

Nick Mamalis

Alan S. Crandall, M.D., focuses on the medical and surgical management of glaucoma and cataracts. Dr. Crandall has experience with trabeculoplasty and laser cyclophotocoagulation. He is involved in numerous clinical research studies at the Moran Eye Center. Dr. Crandall is also the Director of the Medical Education Program. Dr. Crandall lectures all over the world and was selected by Cataract and Refractive Surgery Today as one of the 50 international opinion leaders.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
Scheie Eye Institute, University of Pennsylvania–Philadelphia, PA

FELLOWSHIP:
Scheie Eye Institute, University of Pennsylvania–Philadelphia, PA

ACADEMIC APPOINTMENTS:
Senoir Vice-Chairman and Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Jason Goldsmith, M.D., focuses on the medical and surgical management of cataracts and glaucoma. Dr. Goldsmith's research interests include the use of optical coherence tomography, an ophthalmic imaging technology, for use in screening for angle closure glaucoma.

MEDICAL SCHOOL:
Stanford University School of Medicine–Stanford, CA

RESIDENCY:
Cleveland Clinic Foundation–Cleveland, OH

FELLOWSHIP:
Moran Eye Center University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Assistant Professor, Ophthalmology & Visual Sciences–University of Utah School of Medicine; Assistant Residency Program Director, Chief of Ophthalmology Salt Lake City Veterans Administration

Bradley J. Katz, M.D., Ph.D., specializes in neuro-ophthalmology, and comprehensive ophthalmology. He also evaluates patients with diseases that affect the optic nerve, diseases that affect eye movements, and diseases of the brain that affect vision. Dr. Katz is also the principal investigator for a research grant from the National Institutes of Health to study optic nerve drusen.

MEDICAL SCHOOL:
University of Illinois College of Medicine–Chicago, IL

RESIDENCY:
University of Iowa Hospitals and Clinics–Iowa City, IA

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine.

Nick Mamalis, M.D., focuses his clinical practice on comprehensive Ophthalmology including cataract and other anterior ocular surgeries. As Director of the Ophthalmic Pathology Laboratory, Dr. Mamalis evaluates all specimens submitted to the laboratory. He is a member of the American Association of Ophthalmic Pathologists. He is also Director of the Intermountain Ocular Research Center and is performing research in the area of intra-ocular lenses and postoperative inflammation. Dr. Mamalis lectures all over the world and was selected by Cataract and Refractive Surgery Today as one of the 50 international opinion leaders.

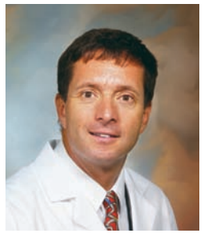
MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
Loyola University Medical Center–Maywood, IL

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

Mark D. Mifflin

Majid Moshirfar



Geoffrey Tabin

Norman A. Zabriskie

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Mark D. Mifflin, M.D., specializes in the medical and surgical treatment of corneal and anterior segment eye diseases. His expertise includes all types of corneal transplantation, cataract surgery, and vision correction using lasers, intra-ocular lenses, and conductive keratoplasty.

MEDICAL SCHOOL:
University of Nevada School of Medicine–Reno, NV

RESIDENCY:
University of Utah–Salt Lake City, UT

FELLOWSHIP:
University of Utah–Salt Lake City, UT
Casebeer Eye Center–Scottsdale, AZ

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Residency Program Director and Education Director for the Department of Ophthalmology; Medical Director–Utah Lions Eye Bank

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Majid Moshirfar, M.D., is the director of the Moran Eye Center's Refractive Surgery Program. Dr. Moshirfar specializes in refractive surgery, medical and surgical management of corneal disorders, cataract removal and inflammatory eye diseases. Dr. Moshirfar lectures extensively around the country on a variety of vision correction procedures and has become a community spokesperson on the benefits and risks of vision correction surgery.

MEDICAL SCHOOL:
Georgetown University–Washington, DC

RESIDENCY:
Illinois Eye and Ear Hospital–Chicago, IL

FELLOWSHIP:
University of Utah–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Assistant Clinical Professor of Ophthalmology–Wright State University School of Medicine

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Geoffrey Tabin, M.D., is a corneal specialist and director of the International Ophthalmology Division at the Moran Eye Center. In addition to his work in Utah providing corneal, cataract and refractive care, Dr. Tabin is working to develop eye care delivery in developing countries. Part of his research includes improving cataract and corneal surgery.

MEDICAL SCHOOL:
Harvard Medical School–Boston, MA

RESIDENCY:
Brown University–Providence, RI

FELLOWSHIP:
Royal Victorian Eye and Ear Hospital–Melbourne, Australia

ACADEMIC APPOINTMENT:
Professor, Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Norman A. Zabriskie, M.D., specializes in the medical and surgical treatment of glaucoma and cataracts. He is the Vice-Chairman of Clinical Operations and the Medical Director of the John A. Moran Eye Center. He has a research interest in the genetics of glaucoma.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
University of Iowa–Iowa City, IA

FELLOWSHIP:
University of Iowa–Iowa City, IA; University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENT:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Vice Chair & Medical Director–University of Utah School of Medicine

Vision Correction Surgery (LASIK, Laser and Non-laser), and Corneal Disease

Dr. Majid Moshirfar performing advanced surface ablation, or PRK surgery, on Dr. Mark Mifflin. It's reassuring when your surgeon is asked to perform surgery on his colleague.

Refractive surgery is the general term referring to many different procedures to correct visual perception or focus, with the objective of reducing or eliminating the need for glasses and contact lenses. This includes such procedures as LASIK, PRK, lens replacement surgery and corneal implants.

The refractive ophthalmologists at the Moran Eye Center have some of the highest successful vision correction outcomes in the Western United States. Drs. Moshirfar, Mifflin and Tabin are specialists in corneal disease and refractive surgery and perform LASIK as well as other vision correction procedures including: PRK, Epi-Lasik, Clear Lens Extraction, CK and implantable contact lenses. The Moran Eye Center is a regional referral center for complications after LASIK, and for complex procedures where the patient has special needs. We are renowned for our caring approach and long-term follow up.

Our ophthalmologists train surgeons in the field of cornea and refractive surgery and are involved in the research and development of laser and non-laser technologies and treatments. For example, our cornea specialists have a long history of research involving the development of PHAKIC intra-ocular lenses (Implantable Contact Lens) technology. These same doctors often lead FDA investigations for vision correction. Director of Refractive Services, Dr. Majid Moshirfar, has been a pioneer in this field. He was the first surgeon to perform Visian ICL and Verisyse Phakic IOL surgery in the state of Utah. Visian ICL and Verisyse Phakic IOL are for highly myopic patients who cannot have LASIK surgery.

We hold educational forums in the evenings several times each month. This helps the patients understand their options and helps us to determine if a patient is a candidate for LASIK surgery. Our forums last approximately one hour and are presented by one of our surgeons. At the conclusion of the forum, the patient has an opportunity to schedule a free consultation.

SERVICES

The patient seeking solutions for vision correction at the Moran Eye Center has the following choices:

LASER:

- LASIK—includingcustom or wavefront technology with iris registration software
- PhotorefractiveKeratectomy (PRK)
- LaserEpithelial Keratomileusis (LASEK)
- Epi-Lasik
- Intralase

NON-LASER:

- IntrastromalCorneal Ring Segments (INTACS)
- ConductiveKeratoplasty (CK)
- ClearLens Extraction (also called Refractive Lens Exchange)
- Implantablecontact lenses
- Multifocaland accommodative lenses
- CustomLASIK technology
- Refractivelens exchange

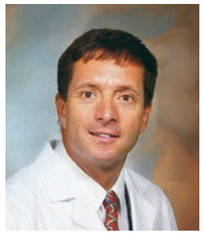
CORNEAL DISEASES AND TREATMENTS, SURGERIES:

- Traditionalcorneal transplant
- Suturelesscorneal transplant
- Partialthickness corneal transplants
- Artificialcornea
- Intacsfor Keratoconus
- Cornealtransplantation
- Highrisk keratoplasty
- Keratoplastyin association with iris and lens abnormalities

Moran's Vision Correction Surgery (LASIK, Laser and Non-laser), and Corneal Disease Specialists

Mark D. Mifflin

Majid Moshirfar



Geoffrey Tabin

Mark D. Mifflin, M.D., specializes in the medical and surgical treatment of corneal and anterior segment eye diseases. His expertise includes all types of corneal transplantation, cataract surgery, and vision correction using lasers, intra-ocular lenses, and conductive keratoplasty.

MEDICAL SCHOOL:
University of Nevada School of Medicine–Reno, NV

RESIDENCY:
University of Utah School of Medicine–Salt Lake City, UT

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT; Casebeer Eye Center–Scottsdale, AZ

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Residency Program Director and Education Director for the Department of Ophthalmology; Medical Director–Utah Lions Eye Bank

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Majid Moshirfar, M.D., is the director of the Moran Eye Center's Refractive Surgery Program. Dr. Moshirfar specializes in refractive surgery, medical and surgical management of corneal disorders, cataract removal and inflammatory eye diseases. Dr. Moshirfar lectures extensively around the country on a variety of vision correction procedures and has become a community spokesperson on the benefits and risks of vision correction surgery.

MEDICAL SCHOOL:
Georgetown University–Washington, DC

RESIDENCY:
Illinois Eye and Ear Hospital–Chicago, IL

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Assistant Clinical Professor of Ophthalmology–Wright State University School of Medicine

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Geoffrey Tabin, M.D., specializes in cornea, cataract, and refractive surgery. Dr. Tabin is a world-class corneal specialist and director of the International Ophthalmology Division at the Moran Eye Center. He is the co-director, of the Himalayan Cataract Project. In addition to his work in Utah providing corneal, cataract and refractive care, Dr. Tabin is working to develop eye care delivery in developing countries. Part of his research includes improving cataract and corneal surgery.

MEDICAL SCHOOL:
Harvard Medical School–Boston, MA

RESIDENCY:
Brown University–Providence, RI

FELLOWSHIP:
Royal Victorian Eye and Ear Hospital–Melbourne Australia

ACADEMIC APPOINTMENT:
Professor, Ophthalmology & Visual Sciences–University of Utah School of Medicine

Dr. Geoffrey Tabin extends his expertise around the world. In addition to his practice as a LASIK and Cataract surgeon at the Moran Eye Center in Salt Lake City, in the past year Dr. Tabin has performed missions to Ghana, Nepal, China, Tibet, and Bhutan.

Glaucoma

Normal vision

Glaucoma

The Glaucoma Service at the Moran Eye Center provides specialized diagnostic, medical and surgical care for the glaucoma patient.

Moran Eye Center surgeons and researchers are actively involved in research to improve surgical procedures involving such areas as Glaucous, I-Stent, Solx and more.

Dr. Alan Crandall in surgery

SERVICES

Diagnostic testing including:

- HumpreyVisual Field
- GoldmanVisual Field
- TangetScreen Perimnetry
- OpticalCoherence Tomography
- ScanningLaser Polarimetry (GDx)
- ElectrophysiologicTesting

Laser treatment of glaucoma including:

- Selective Laser Trabeculoplasty (SLT)
- Argon Laser Trabeculoplasty (ALT)
- YAG Laser Iridoplasty
- Endoscopic Cyclophotocoagulation (ECP)
- Argon Laser ciliary body ablation
- Diode Laser ciliary body ablation

Surgical treatment of glaucoma including:

- Trabeculectomywith and without antimetabolites
- Non-penetratingglaucoma surgery: Aquaflow and Viscocanalostomy
- Glaucomaimplant surgery: Ahmed, Baeveldt, Molteno, and Krupin implants

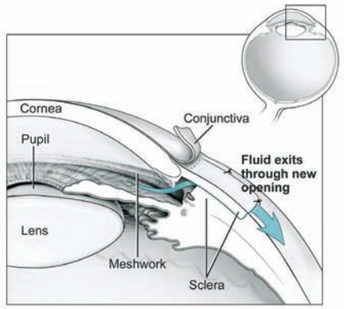
Medical and Surgical Treatment of Congenital
(Pediatric) Glaucoma

- Goniotomy
- Trabeculotomy

How Glaucoma Develops

In the front of the eye is a space called the anterior chamber. A clear fluid flows continuously in and out of the chamber and nourishes nearby tissues. The fluid leaves the chamber at the open angle where the cornea and iris meet (see diagram above). When the fluid reaches the angle, it flows through a spongy meshwork, like a drain, and leaves the eye.

Sometimes, when the fluid reaches the angle, it passes too slowly through the meshwork drain. As the fluid builds up, the pressure inside the eye rises to a level that may damage the optic nerve. When the optic nerve is damaged from increased pressure, open-angle glaucoma and vision loss may result.



Moran's Glaucoma Specialists

Alan S. Crandall

Jason Goldsmith

Norman A. Zabriskie

Alan S. Crandall, M.D., focuses on the medical and surgical management of glaucoma and cataracts. Dr. Crandall has experience with trabeculoplasty and laser cyclophotocoagulation. He is involved in numerous clinical research studies at the Moran Eye Center. Dr. Crandall is also the Director of the Medical Education Program.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
Scheie Eye Institute, University of Pennsylvania–Philadelphia, PA

FELLOWSHIP:
Scheie Eye Institute, University of Pennsylvania–Philadelphia, PA

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Jason Goldsmith, M.D., focuses on the medical and surgical management of cataracts and glaucoma.

MEDICAL SCHOOL:
Stanford University School of Medicine–Stanford, CA

RESIDENCY:
Cleveland Clinic Foundation–Cleveland, OH

FELLOWSHIP:
Moran Eye Center University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Assistant Professor, Ophthalmology & Visual Sciences–University of Utah School of Medicine; Assistant Residency Program Director, Chief of Ophthalmology Salt Lake City Veterans Administration

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Norman A. Zabriskie, M.D., specializes in the medical and surgical treatment of glaucoma and cataracts. He is the Vice-Chairman of Clinical Operations and the Medical Director of the John A. Moran Eye Center. He has a research interest in the genetics of glaucoma.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
University of Iowa–Iowa City, IA

FELLOWSHIP:
University of Iowa–Iowa City, IA; University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENT:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Vice Chair & Medical Director–University of Utah School of Medicine

What is Glaucoma?
Glaucoma is an eye disease in which the normal fluid pressure inside the eyes slowly rises, leading to vision loss—or even blindness.

Facts about Glaucoma

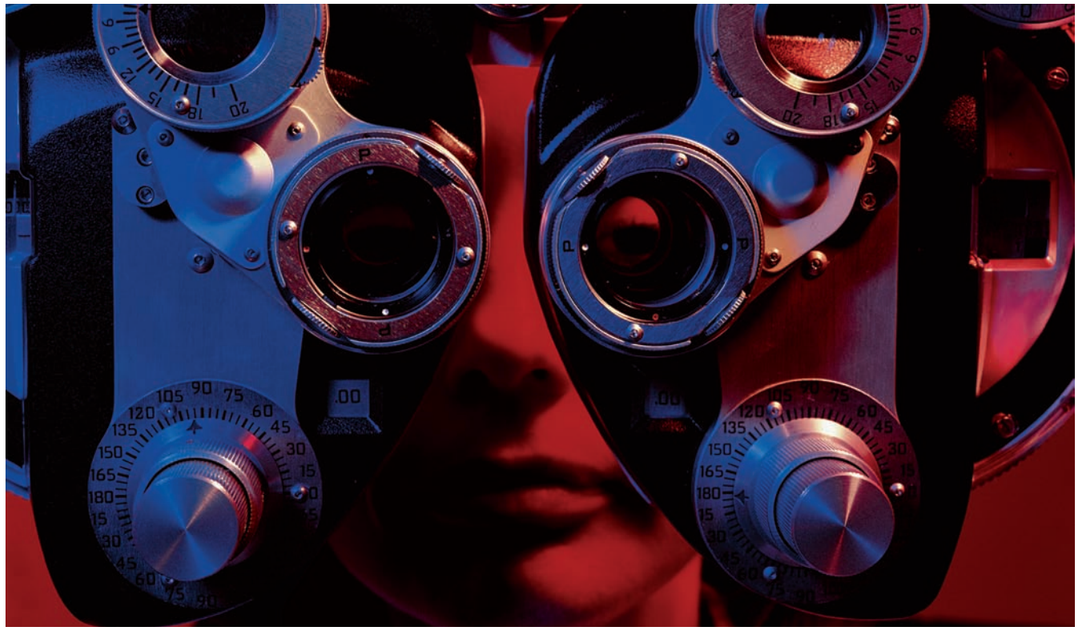
- There are two basic types of Glaucoma, open-angle and narrow-angle (or angle-closure) glaucoma.
- Open-angle is the most common form, accounting for 90% of all cases and is associated with aging.
- When a person ages, the eye's drainage apparatus may not work as effectively as it should.
- In narrow-angle glaucoma, the eye pressure is normal until the drainage angle becomes suddenly blocked. Eye pressure rises abruptly to dangerous levels. Immediate treatment is necessary.
- Increased eye pressure means you are at risk for glaucoma, but does not mean you have the disease.
- Glaucoma can develop without increased eye pressure.

Who is at risk?
Anyone can develop glaucoma. Some people are at higher risk than others. They include:

- African Americans over age 40.
- Everyone over age 60, especially Hispanic Americans.
- People with a family history of glaucoma.

How do you know if you have Glaucoma?
At first, open-angle glaucoma has no symptoms. It causes no pain. Vision stays normal. As glaucoma remains untreated, people may miss objects to the side and out of the corner of their eye.

Optometry, Contact Lenses and Glasses



The Contact Lens Service at the Moran Eye Center provides an entire range of contact lens fitting and care. The most recent advancements in contact lens technology are available with state-of-the-art treatment being provided.

We utilize the most up-to-date materials and modalities. We teach and train residents and other post-doctoral providers in specialty contact lens services through the Department of Ophthalmology and Visual Sciences at the University of Utah. In addition, we are conducting ongoing investigational studies into the management of keratoconus.

SERVICES

- Specialized and complex contact lens fittings
- Complete eye examinations
- Complete contact lens evaluations
- Pediatric contact lens fitting
- Keratoconus treatment
- Fitting of traumatized eyes
- Aphakic contact lens fitting
- Cosmetic contact lens fitting
- Geriatric contact lens fitting
- Orthokeratology
- Fitting of astigmatic eyes with rigid and soft contact lens material
- Bifocal contact lenses

Harald E. Olafsson

Craig M. Smith

Harald E. Olafsson, O.D., is the Director of Contact Lens Services, and specializes in the fitting of contact lenses. His particular interests lie in the area of keratoconus, pediatrics and fitting traumatized eyes, and eyes with severe or irregular astigmatism. Dr. Olafsson also provides primary eye care for those who do or do not wear contact lenses.

MEDICAL SCHOOL:
Southern California College of Optometry–Fullerton, CA

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Assistant Professor of Optometry–Southern California College of Optometry

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Craig M. Smith, O.D., is the Director of Vision Services at the John A. Moran Eye Center's Community Clinics. He is a Doctor of Optometry at the Greenwood Medical Center. Dr. Smith has professional interests in children's vision, sports vision, contact lenses and general optometry.

EDUCATION:
Brigham Young University–Provo, UT

MEDICAL SCHOOL:
Southern California College of Optometry–Fullerton, CA

ACADEMIC APPOINTMENTS:
Adjunct Clinical Instructor–University of Utah School of Medicine;

Kinlee being fitted by Ellen Linde-Fagergren, Optician, ABO Certified Pediatric Specialist at the Moran Optical Shop.

Glasses for Kinlee

Any parent of a child with Down Syndrome knows that their child enjoys an abundance of three things: energy, happiness, and love. Two-year-old Kinlee is no different, and it's that energy component that makes wearing a pair of glasses such a challenge for her. How do you get her to like them? How do you get them to fit her properly? And most challenging, how do you get her to keep them on?

Kinlee's mother, Cherise, remembers their initial frustration. "We went to an optical place where our insurance company said to go. They sat us down in front of a huge book and told us to pick out a frame." Kinlee's father Kenneth recalls, "We spent two months trying to get something she would wear, and nothing seemed to work. We were finally referred to the Moran Eye Center where we met Ellen."

"We learned more in 15 minutes with Ellen than we had in the previous two months trying to find her glasses," Cherise recalls. "With Ellen's guidance, we had Kinlee's glasses picked out, ordered, and on her face in less than a week—and she hasn't taken them off since. We went out to dinner after her first day of wearing them. Kinlee had not been able to react to facial expressions if someone was more than a few inches from her face. I'll always remember how, at the restaurant we were so touched when Kinlee reacted to everything we did from across the table. We knew she could see, and probably see better than she had ever seen in her life."

Ellen Linde-Fagergren is an Optician and ABO Certified Pediatric Specialist in the optical shop at the Moran Eye Center at the University of Utah. She is a certified pediatric optician with more than 10 years experience fitting glasses for our youngest patients. "I knew that with Down Syndrome we needed to look for special characteristics in glasses," Ellen recalls. "We were looking for simple things that make a big difference, like a slightly wider bridge across the nose, an extremely light frame and lens, and yet it had to be very strong and durable."

When Kinlee grows out of her new pink glasses, her mom and dad say they'll be back to the Moran Eye Center for more. After all, she'll still be full of that love, happiness, and especially her non-stop energy.

Community Locations and Optical Shops

The Moran Eye Center has 12 community locations with optometrists for your convenience across the Wasatch Front.

JOHN A. MORAN EYE CENTER AT THE UNIVERSITY OF UTAH
Drs. Harald Olafsson & Mark McKay
65 N. Medical Drive, Salt Lake City, UT 84132
Surgery, Ophthalmology and Optical: 581-2352

DAVIS VISION CENTER
Dr. Alan Morgan
1492 W. Antelope Drive, Layton, UT 84041
Optometry and Optical: 801-779-7804

GREENWOOD HEALTH CENTER
Drs. Craig Smith, Bryan Vincent, Clair Palmer, Mark McKay
7495 S. State, Midvale, UT 84047
Optometry and Optical: 801-213-9520

OLD MILL MEDICAL CENTER
Dr. Mark McKay
6360 South 3000 East, Suite 200, Salt Lake City, UT 84121
Ophthalmology, Optometry and Optical: 801-585-3937

The caring staff at the Moran Rocky Mountain Eye Clinic–1 of 12 teams ready to serve your eye care needs at Moran Eye Clnics.

PARKWAY HEALTH CENTER
Dr. Clair Palmer
145 West University Parkway, Orem, UT 84058
Pediatric–Ophthalmology, Optometry and Optical:
801-234-8530

PRIMARY CHILDREN'S MEDICAL CENTER
Moran Ophthalmology Clinic
65 N. Medical Drive, Salt Lake City, UT 84132
Pediatric Ophthalmology, Optometry and Optical referral: 801-588-3331

REDSTONE HEALTH CENTER
Dr. Colleen Schubach
1743 W. Redstone Center Dr. Suite 115, Park City, UT 84098
Ophthalmology, Optometry and Optical: 435-658-9250

REDWOOD HEALTH CENTER
Drs. Robert Corry & Mark McKay
1525 W. 2100 S., Salt Lake City, UT 84119
Ophthalmology, Optometry and Optical: 801-213-9940

ROCKY MOUNTAIN OPHTHALMOLOGY
4400 South 700 East, Suite 240, Salt Lake City, UT 84107
Ophthalmology: 801-264-4464

STANSBURY HEALTH CENTER
Dr. Timothy Gibbons
220 Millpond Road Suite 100
Stansbury Park, UT 84074
Optometry and Optical: 435-843-3040

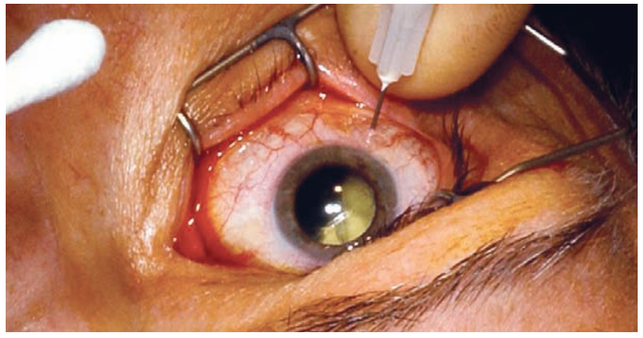
SOUTH JORDAN HEALTH CENTER
Drs. Bryan Vincent & Robert Corry
1091 W. South Jordan Parkway, Suite 500, South Jordan, UT 84095-9061
Optometry and Optical: 801-213-9840

WESTRIDGE HEALTH CENTER
Dr. Ted Hemsley
3730 W. 4700 S., West Valley City, UT 84118
Optometry and Optical: 801-213-9240

Uveitis, Ocular Infectious Disease, Ocular Immunology

The Moran Eye Center is fortunate to have one of the top Uveitis specialists in the world, Dr. Albert T. Vitale. He works in partnership with the Cornea, Glaucoma, Retina, Ophthalmic Plastic Surgery and Neuro-Ophthalmology Services in a multi-disciplinary approach to inflammatory and infectious disease involving the eye and its adnexa.

At the Moran Eye Center we offer the expertise for state of the art treatment for uveitis and other ocular infectious diseases, and have the potential to develop novel approaches and drug delivery systems. The ultimate beneficiaries will be the patients who suffer with this disease.



Intravitreal injection of steroid in a patient with refractory uveitis and macular edema.

What is Uveitis?

Uveitis is inflammation of a part of the eye called the uvea. The uvea (pronounced "You-Vay-Uh") is a layer of the eye made up of three parts. These are the iris, the ciliary body, and the choroid.

Uveitis can occur in one eye or both eyes. Inflammation of the uvea may involve other parts of the eye, or any part of the eye, including the cornea (the clear, curved front of the eye), the sclera (the white outer part of the eye), the vitreous body, the retina and the optic nerve.

Uveitis, or intra-ocular inflammatory disease, does not attract massive funding or attention, but it causes 10% of blindness in the United States. Up to 60% of people with posterior segment disease (involving retina and back of the eye) have significant visual loss (less than 20/60) and up to 30% become legally blind. Some estimates suggest it is the 4th leading cause of blindness in the country. In general, it is poorly understood, difficult to treat, and under treated.

SERVICES

Specialized evaluation and medical and surgical treatment in the following areas:

- Acute,chronic or recurrent iritis
- Herpesvirus uveitis and kerato-uveitis
- Parsplanitis and other posterior uveitis
- Intra-ocular infectious disease
- Chorioretinitis
- Infectiousretinitis
- Uveitisassociated with systemic disease
- Scleritis and peripheral ulcerative keratitis
- Postoperativeinfectious and inflammatory disease
- Complicatedcataract secondary to uveitis
- Retinal vasculitis
- Diseasesassociated with AIDS and with transplant-related immunosuppression
- Cystoidmacular edema
- Preoperativeconsultation regarding immunosuppression and anti-inflammatory disease
- Medicationsand surgical techniques

Albert T. Vitale

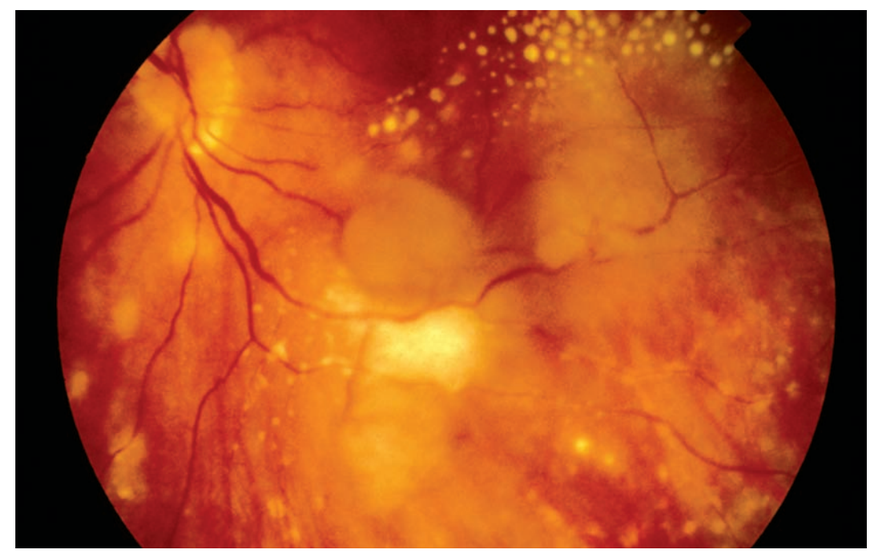
Albert T. Vitale, M.D., specializes in the medical and surgical treatment of patients suffering from diseases of the retina and vitreous. He is also one of the only ophthalmologists in the Intermountain West specializing in the diagnosis and treatment of uveitis and other infections and inflammatory diseases of the eye. His research interests include ocular manifestations of systemic diseases, novel therapeutic agents and new drug delivery systems in the treatment of ocular inflammatory disease, retinal vascular disease, and the pharmacotherapy of age-related macular degeneration. He is also one of about a handful of people in the country with dual training in ocular immunology and inflammatory disease as well as vitreoretinal surgery, and the only provider of such expertise in the Intermountain West. He is also co-author of the definitive text on the subject, with Dr. Steven Foster, entitled, *Diagnosis and Treatment of Uveitis.*

MEDICAL SCHOOL:
New York Medical College–Valhalla, NY

RESIDENCY:
St. Vincent's Hospital & Medical Center–New York, NY

FELLOWSHIP:
Harvard University, Massachusetts Eye and Ear Infirmary–Boston, MA

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine



Multiple retinal and choroidal nodular granulomas, perivasculitis, and vitritis in a patient with sarcoid-associated posterior segment involvement.

"I appreciate every day I can see."

Holly swimming with her three nieces.

I feel the Lord has guided me to you,
Because you're a child of His and He has faith in what you do,
I came to you for help and cried please don't let me go blind,
Since that day, you took it to heart and kept me in mind,
For the open heart you offered and the care you have shown,
You made me feel as if I was your own,
I want to thank you for not giving up on me,
Because today I wouldn't be able to see,
If the day shall come and my eyesight has gone,
You have inspired me enough to know that I can go on.

By Holly Barton (dedicated to Dr. Vitale at the Moran Eye Center)

Hopeful Sight

Anyone with diabetes or close to someone with diabetes understands that vision loss is a constant concern. Holly is no exception. A few years ago Holly's multiple vision complications would have been beyond the scope of medical treatment. Today, thanks to advances in vision science, technology and ophthalmology surgery, she can see.

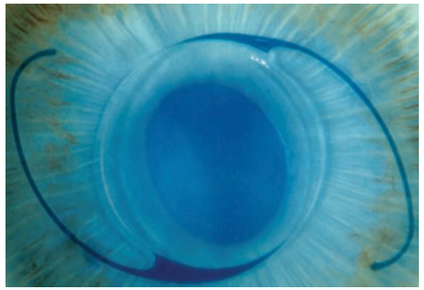
Holly came to the Moran Eye Center with a multitude of ocular problems. She had advanced diabetic retinopathy complicated by macular edema (swelling of the retina) neovascularization (abnormal growth of blood vessels on the retinal surface), nonvascular glaucoma, and cataract. Any one of these conditions calls for extensive treatment; together they presented an enormous challenge.

Dr. Vitale, a specialist in vitreoretinal surgery and uveitis, ocular inflammatory and infectious diseases, took Holly under his wing and gave her hope for the future. Together with Dr. Zabriskie, a cataract and glaucoma surgeon at the Moran Eye Center, they began treating Holly with multiple laser procedures and intravitreal injections of medications to control the retinal edema and abnormal blood vessels. She has had multiple surgeries to control the nonvascular glaucoma and cataract—all of which are complications of her diabetes.

"I wanted to see again, and I dreamed of one day being able to ride a bike and swim with my three beautiful nieces," Holly says. "It started three years ago. I began seeing floaty things in my eyes. My diabetic retinopathy left me blind in both eyes. After many treatments and lots of surgeries I got my eyesight back in my right eye. I should be blind right now, but thanks to the wonderful doctors at the Moran Eye Center who never gave up on me, I am able to see, read, and enjoy swimming and bike riding with my nieces. Last year just before the holidays I wrote Dr. Vitale a poem that came right from my heart."

Holly says she appreciates every day that she can see, and the poem she wrote to Dr. Vitale conveys the idea that no matter what happens in the future, he has inspired her to go on.

Ophthalmic Pathology



IOL (intra-ocular lens)

SERVICES

The Ophthalmic Pathology Laboratory at the Moran Eye Center provides a full range of services in the processing of ophthalmic specimens including the processing of:

- Acute,chronic or recurrent iritis
- Ocularissue
- Adnexaltissue
- Entireglobes
- Exenterationspecimens

We also perform:

- Light microscopy utilizing both standard and special stains

Special services available in conjunction with the University of Utah Department of Pathology include:

- Cytology
- Frozensections
- Immunohistochemicalstaining
- Scanningand transmission of electron microscopic studies

Dr. Mamalis reviews specimens with residents and fellows.

Nick Mamalis

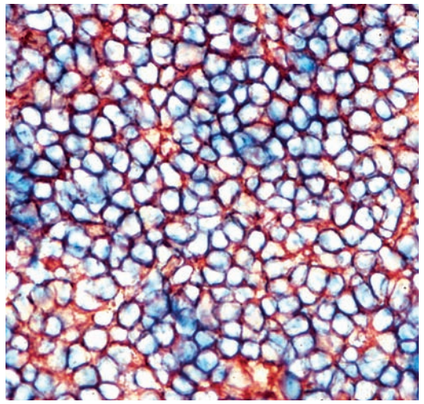
Nick Mamalis, M.D., focuses his clinical practice on comprehensive Ophthalmology including cataract and other anterior ocular surgeries. As Director of the Ophthalmic Pathology Laboratory, Dr. Mamalis evaluates all specimens submitted to the laboratory. He is a member of the American Association of Ophthalmic Pathologists. He is also Director of the Intermountain Ocular Research Center and is performing research in the area of intra-ocular lenses and postoperative inflammation.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
Loyola University Medical Center–Maywood, IL

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine



Tumor cells in the orbit

Dr. Scott Larson, Jared recovering from BB gun accident, Dr. Dan Kline, Chief Resident.

Kids Will Be Kids

Nine-year-old Jared appears resolute as he talks with Dr. Scott Larson, pediatric ophthalmologist at the Moran Pediatric Eye Clinic located on the 4th floor of Primary Children's Medical Center. Jared describes the events that led up to today's visit. He has an honest air about him. "My goggles were loose and they fell off," he explains," and before I could put them back on, I got shot. A wry smile drifts across his face. "I got shot," sounds quite remarkable to an adolescent.

Jared was hit in the eye with an Air Soft BB—a little yellow pellet that seems quite harmless. He understands now that velocity made up for the relative softness of the projectile. Fortunately his eye appears to have sustained a temporary injury that will heal with care and a little medicine.

"It didn't really hurt, you know", Jared says, "like it was just kind of buggin' me, yea, it bugged me when it happened but I kept playin' anyway."

Jared's mom describes what happened. "He is very conscientious and always wears his goggles," she says. He didn't tell me a thing and like he said, he just kept on playing. That is so much like him. But after about an hour he was in real bad pain and it wouldn't go away. At that point I thought someone should look at it and so did Jared."

It's obvious that Dr. Larson enjoys working with young people. He gives him some drops and offers sound advice. He tells Jared to specifically stay off the trampoline and his bike for a week. "Don't play too much at first," Dr. Larson says. Then he asks Jared if he wants him to write a note for his teacher to let him stay in from recess and gym. Jared says, "no, she'll believe me." And you get the feeling she will.

Pediatric Ophthalmology and Adult Strabismus

The Moran Eye Center's Pediatric Ophthalmology and Strabismus Service provides comprehensive medical and surgical care for a wide range of eye diseases and visual impairments in children as well as evaluation and management of strabismus in both children and adults. Based at both the Moran Eye Center and Primary Children's Medical Center, the service provides specialized care for patients from across the Intermountain West. Comprehensive inpatient consultation services are available at both Primary Children's and University Hospitals.

SERVICES

- Completeeye examination for children
- Lacrimal disorders
- Retinopathyof prematurity
- Eyeinvolvement in developmental, genetic and craniofacial disorders
- Cataractin infancy and childhood
- Strabismusin children and adults
- Complicatedstrabismus including re-operation, cranial nerve palsy and thyroid
- Eyedisease
- Botulinumtoxin injection
- Pre-operativeprism adaptation
- Adjustablesuture surgery for most adults and selected children

Special services available in conjunction with other Moran Eye Center Services:

- Electrophysiologictesting (ERG, EOG, VEP, saccadic velocity)
- Cornealor retinal disease
- Glaucoma
- Eyelidand orbital problems and ocular tumors

Moran's Pediatric Ophthalmology and Adult Strabismus Specialists

David C. Dries

Robert O. Hoffman

Scott A. Larson

David C. Dries, M.D., provides medical and surgical care for a wide range of eye diseases and visual impairments in children as well as evaluation and management of strabismus in both children and adults. He has special interest in amblyopia, esotropia, exotropia, retinopathy of prematurity, retinoblastoma, infant and childhood cataracts, and nasolacrimal duct obstruction.

MEDICAL SCHOOL:
University of Wisconsin–Madison, WI

RESIDENCY:
University of Illinois Eye and Ear Infirmary–Chicago, IL

FELLOWSHIP:
University of Iowa–Iowa City, IA

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Robert O. Hoffman, M.D., is Chief of the Division of Pediatric Ophthalmology and Eye Muscle Disorders. Dr. Hoffman has special interests in retinopathy of prematurity, ocular problems associated with genetics, craniofacial disorders, cataracts in infants and children and complicated strabismus.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
W.K. Kellogg Eye Center, University of Michigan–Ann Arbor, MI

FELLOWSHIP:
Indiana University–Indianapolis, IN

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Chief, Division of Pediatric Ophthalmology & Eye Muscle Disorders

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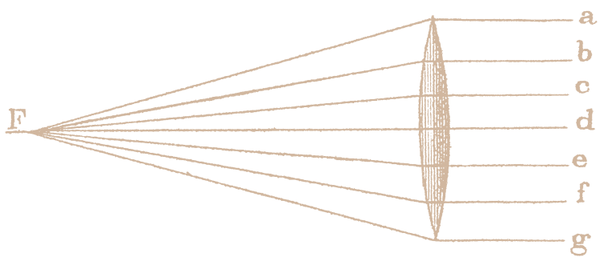
Scott A. Larson, M.D., provides medical and surgical care for a wide range of eye diseases and visual impairments in children, evaluation and management of strabismus in both children and adults. Dr. Larson provides specialized care for patients from across the Intermountain West.

MEDICAL SCHOOL:
Loma Linda University School of Medicine–Loma Linda, CA

RESIDENCY:
University of Iowa–Iowa City, IA

FELLOWSHIP:
University of Iowa–Iowa City, IA

ACADEMIC APPOINTMENT:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine



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Debbie and Kimber DeFillipis

A Lifetime of Sight

If successful, the surgery will allow Kimber to see for the rest of her life.

Seventeen ounces is what Kimber weighed when she came into this world, and began her four month stay at the University of Utah Hospital's Newborn Intensive Care Unit. Just one ounce over a pound, Kimber had arrived four months early and would need many surgeries before she was released to go home to Idaho Falls with her parents, Debbie and Brian. The last two operations would be eye surgery. She had partially detached retinas and microsurgery was needed.

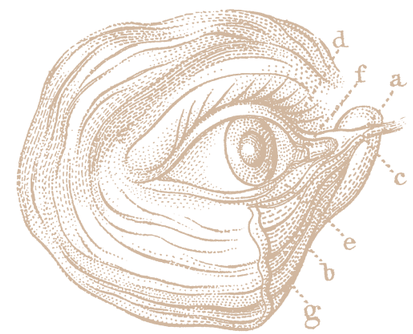
Moran retinal surgeon Michael Teske is the only surgeon in the Intermountain West specifically trained to carry out this extremely delicate surgical procedure. Imagine how small the average adult human retina is and then think of the retina of a premature baby. If successful, the surgery would allow Kimber to see for the rest of her life. Without it, blindness would be the likely outcome.

With great care and concern Kimber's nurses wheeled her across the bridge connecting the University Hospital to the Moran Eye Center for her surgery. An hour later, wearing the smallest pink eye patch available, Debbie and Brian gently caress her chest like they have done so many times during the last 120 days.

"The success rate for repairing partially detached retinas is almost 90 percent," says Dr. Teske. "Kimber's peripheral vision may suffer and she may need glasses, but she likely won't be blind."

Kimber started out about the size of a dollar bill from shoulder to toes, and now she has grown to 6 pounds 11 ounces. Her future is bright–even brighter thanks to the miracle of modern pediatric ophthalmic microsurgery.

Neuro-Ophthalmology



Moran Neuro-Ophthalmology physicians review brain scans.

The Neuro-Ophthalmology Service at the Moran Eye Center is equipped to diagnose and manage a wide range of neurological disorders related to the visual pathways and ocular motor systems including:

- Optic neuritis (including multiple sclerosis)
- Post traumatic visual disorders
- Unexplained facial and eye pain
- Papilledema (including pseudotumor cerebri)
- Ischemic optic neuropathy (including temporal arteritis)
- Compressive optic neuropathy
- Pituitary tumors
- Cerebrovascular disease involving vision
- Thyroid eye disease
- Myasthenia gravis
- Ocular motor nerve disorders
- Gaze palsies and nystagmus
- Facial movement disorder (blepharospasm, hemifacial spasm)
- Unexplained visual loss

SERVICES

- Visual fields
- Optic nerve function tests (contrast sensitivity, flicker, color testing)
- Visual evoked potentials; auditory evoked potentials
- Electroretinogram (ERG) including multi-focal ERG
- Infrared pupillography and recording
- Tensilon testing
- Pharmacologic pupil testing
- Botulinum injections for blepharospasm, hemifacial spasm, migraine
- Temporal artery biopsy
- Optic nerve sheath decompression for papilledema and progressive ischemia
- Optic neuropathy
- Evaluation of paralytic strabismus and thyroid ophthalmoplegia

We have direct and immediate access to the following services at the University of Utah Hospital:

- MRI, including a high resolution 3.0T magnet MR angiography and MR Venography
- CT, including CT angiography
- Carotid doppler and ultrasound
- Color flow doppler imaging of the eye and orbit
- Orbital Ultrasound with A and B scans
- Cerebral angiography including venography and interventional neuron-radiology

Moran's Neuro-Ophthalmology Specialists


Donnell Creel


Kathleen Digre


Bradley J. Katz


Judith E.A. Warner

Donnell Creel, Ph.D., conducts electrophysiology testing on patients where this information will be helpful for a more accurate diagnosis.

MEDICAL SCHOOL:
University of Missouri–Kansas City, MO; University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENT:
Research Professor of Ophthalmology & Visual Sciences, Neurobiology & Anatomy, Neuroscience–University of Utah School of Medicine

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Kathleen Digre, M.D., specializes in neuro-ophthalmology. She evaluates and treats complex visual complaints which can be due to optic nerve or brain disease. Her interests include gender differences in neuro-ophthalmic disorders, pseudotumor cerebri, ischemic optic neuropathy, temporal arteritis, papilledema, episodic vision loss, headaches and eye pain, diplopia and Graves' Disease. She has worked with NANOS and the University Eccles Library to develop a Neuro-ophthalmology virtual educational library (NOVEL) on the internet at http://medlib.med.utah.edu/NOVEL/.

MEDICAL SCHOOL:
University of Iowa Medical School–Iowa City, IA

RESIDENCY:
University of Iowa Medical School–Iowa City, IA

FELLOWSHIP:
University of Iowa Medical School–Iowa City, IA

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences & Neurology–University of Utah School of Medicine

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Bradley J. Katz, M.D., Ph.D., clinical interests include cataract, general ophthalmology and neuro-ophthalmology. He also evaluates patients with diseases that affect the optic nerve, diseases that affect eye movements and diseases of the brain that affect vision.

MEDICAL SCHOOL:
University of Illinois College of Medicine–Chicago, IL

RESIDENCY:
University of Iowa Hospitals and Clinics–Iowa City, IA

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences and Neurology–University of Utah School of Medicine

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Judith E.A. Warner, M.D., specializes in neuro-ophthalmology–the study of the eye as it relates to the brain. She evaluates complex visual complaints which can be due to optic nerve or brain disease and provides treatment for these disorders. Her interests include diplopia, temporal arteritis, papilledema, episodic vision loss, and migraine.

MEDICAL SCHOOL:
College of Physicians & Surgeons, Columbia University –New York, NY

RESIDENCY:
Harvard University, Massachusetts General Hospital –Boston, MA

FELLOWSHIP:
Harvard University, Massachusetts Eye and Ear Infirmary –Boston, MA

ACADEMIC APPOINTMENT:
Associate Professor of Ophthalmology & Visual Sciences, Associate Professor of Neurology–University of Utah School of Medicine

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Jon C. Lindgren, PA, has experience in neurologic rehabilitation, family practice, orthopedics, dialysis and industrial medicine. He works on a daily basis with our neuro-ophthalmology physicians and patients. He has particular expertise in management of complicated headaches.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

Caring

Above: Quinn and his sister Claire.
Left: Quinn with his mother Lorraine and sister Claire.

He is only seven years old, yet Quinn has experienced blindness four different times. When Quinn was five, his mother, Lorraine, brought him to the Moran Eye Center—at the time he was blind in both eyes. Quinn was diagnosed by neuro-ophthalmologist, Dr. Kathleen Digre, with optic neuritis. This condition is caused by inflammation of the optic nerve in one or both eyes, which can lead to sudden vision loss.

His blinding eye condition started as acute disseminated encephalomyelitis (ADEM), a disease that attacks the protective coating of the nerves. He was initially hospitalized for a month, which included one week in a coma. During this time he was treated with high dose steroids that together with his body's curative capacity relieved his disease for a time.

Lorraine describes the challenges they have faced. "This disease stripped both of his optic nerves and left him blind at age 4. As his body fought the disease, he regained his sight for a while. This last bout with optic neuritis left Quinn completely blind in one eye. Today a diagnosis of Multiple Sclerosis is possible and Dr. Digre is treating him with medications used for MS," Lorraine says.

"We see Dr. Digre several times each year for special MRI tests, monitoring and updates, or if I notice a change in Quinn's behavior or eyesight," Lorraine says. "I have come to accept that they can't cure Quinn's disease at this stage in medical history. There is no surgery or drug that can make it better for him. What I appreciate about Dr. Digre is that she is always willing to take time for us when we feel like we're in a crisis. She is always there for us."

Lorraine describes a time when she was talking to Dr. Digre and one of the residents took a copy of Quinn's MRI's to study because Quinn's case is so unusual. "I said to the resident 'if he's presenting this and somebody has a really brilliant idea that we haven't thought of yet for treating Quinn, you'll let us know won't you.' Dr. Digre stopped me and said, 'Don't worry, Lorraine, there are a few patients that don't leave your brain, you dream about them, you think about them in the shower, and Quinn is one of them.'"

"I'll never forget that statement," Lorraine says with a great deal of emotion. "It touched me so much because I didn't know—I didn't understand how much she cared about us, about my special son. While they may not be able to completely cure his disease, Dr. Digre's caring affection for Quinn has had a healing effect on our entire family."

Oculoplastic and Facial Plastic Surgery

Dr. Bhupendra Patel in surgery

The Ophthalmic Plastic and Reconstructive Surgery Service at the Moran Eye Center specializes in the evaluation and management of both cosmetic and functional abnormalities which affect the eyelids, eyebrows, cheeks, orbital tissues, bones and tear drainage system.

Ophthalmic plastic and reconstructive surgeons at the Moran Eye Center are board certified ophthalmologists who have completed additional and very specialized training in plastic surgery of the eyes and their surrounding structures.

Our oculoplastic and facial plastic surgeons understand the complex workings of the vision system and its subtle relationship to cosmetic enhancement procedures.

Where is the line between cosmetic surgery to improve ones appearance and surgery to repair an injury or physical impairment? Moran ophthalmic plastic and reconstructive surgeons move back and forth across that line on a regular basis, often times accomplishing both goals during the same surgical procedure. As in the story that follows, while healing a patient in pain from Graves' Disease our surgeons often improve appearance at the same time.

"Functional" plastic and reconstructive surgery involves repairing the multitude of problems that affect the basic functions of the eye, which result in optimal vision. Eyelids, burns, tumors, injuries and more can all require functional reconstructive and plastic surgery on and around the eye. On the other hand, many patients choose elective surgery, not to repair the eye or enhance vision but to bring about what they perceive as an improved and/or younger appearance. Often these procedures do not require an overnight stay in the hospital.

We also work closely with other departments and divisions including: Otolaryngology, Neuro-Radiology, Neurosurgery, Dermatology, and the Craniofacial team concerning extensive multi-disciplinary problems of the orbit and facial region.

Here are examples of several common conditions treated by oculoplastic surgeons:

PTOSIS (PRONOUNCED "TOSIS")

Is the medical term for drooping of the upper eyelid, a condition that may affect one or both upper eyelids. When the level of the upper lid margin falls, it can interfere with the upper field of vision. Symptoms include a decreased ability to keep the eyes open, eyestrain, and eyebrow fatigue from the increased effort needed to raise the eyelids.

The out-patient surgery for ptosis is performed under local anesthesia, so there is no need for an overnight stay.

UPPER EYELID BLEPHAROPLASTY (EYE LIFT)

Upper and lower eyelid blepharoplasty, ectropion, and entropion repairs are other out-patient surgeries with similar recovery times.

This procedure reduces excess skin and fat in the upper eyelids. The overlapping skin often interferes with normal vision and has to be corrected to regain a functional visual field. During the out-patient procedure, excess skin and fat is removed. Typically, the incision is barely visible and fades over time. The physician often recommends blepharoplasty if a significant improvement in the visual field can be achieved.

LOWER EYELID BLEPHAROPLASTY

Reduces excess fat and skin in the lower eyelids.

ENTROPION

Entropion is a condition where the eyelid margin turns inward. The lower lashes rub against the eye, causing irritation, scratchiness, tearing, and redness. Typically, surgery is recommended to correct the problem.

Moran surgical team caring for a patient after surgery.

SERVICES

- Ptosis–eyelids that droop
- Brow lift–eyelid rejuvenation
- Excessive tissues of the eyelids
- Botox and facial wrinkles
- Eyelid bumps and tumors
- Periocular skin cancer–skin tumors around the eye
- Orbital tumors
- Eyelid malpositions
- Injuries to the soft tissues or bones around the eye
- Thyroid eye disease
- Blepharospasm and squeezing disorders on the eyes
- Facial nerve palsy
- Eyelash abnormalities
- Congenital lacrimal obstruction–tearing in children
- Dacryocystorhynostomy (DCR)–creating a new tear drain
- Entropion–eyelids that turn in
- Ectropion–eyelids that turn out
- Thyroid eye disease–protruding, irritated eyes
- Enucleation and evisceration–loss of an eye
- Artificial eye and anophthalmic socket disorders
- Graves' eye disease
- Dry eyes and tearing problems
- Temporal artery biopsies

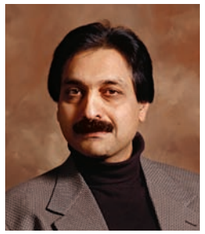
Some of the more common problems treated surgically include droopy brows, droopy lids, redundant upper and lower eyelid skins, furrows on the forehead and around the eyes, and congenital disfigurements such as:

- Facial burns
- Domestic violence
- Auto accidents
- Gunshot wounds
- Lacerations
- Congenital disfigurements
- Bite wounds

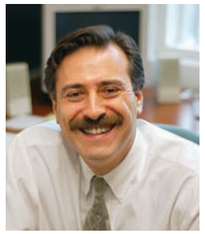
We have direct and immediate access to the following services at the University of Utah Hospital:

- MRI and CT
- Color doppler imaging of the eye and orbit

Moran's Oculoplastic and Facial Surgery Specialists



Bhupendra Patel



David A. Weinberg

Bhupendra Patel, M.D., FRCS, FRC, is an expert in the management of disorders involving eyelids, periorbital tissues, lacrimal system and facial bones including fractures. His clinical research interests include thyroid disease, optic nerve disorders, orbital and eyelid tumors, blepharospasm, lacrimal surgery and facial cosmetic surgery.

MEDICAL SCHOOL:
University of Liverpool–Liverpool, England; University of London–London, England

RESIDENCY:
University of Liverpool and Moorfields Eye Hospital–Liverpool, England; University of London–London, England

FELLOWSHIP:
Moorfields Eye Hospital–Liverpool, England; University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Professor, Ophthalmology & Visual Sciences–University of Utah School of Medicine

David A. Weinberg, M.D., FACS, specializes in ophthalmic plastic and facial cosmetic surgery cosmetic and reconstructive surgery of the eyelids and areas around the eye including orbital disorders/surgery, special interest in thyroid eye disease, endoscopic browlift surgery, botulinum toxin injections and tear duct surgery. Dr. Weinberg also specializes in neuro-ophthalmology. He is an expert in neurologic conditions affecting the eyes such as blepharospasm and facial and optic nerve disorders, and double vision.

MEDICAL SCHOOL:
Albany Medical College–Albany, NY

RESIDENCY:
University of Cincinnati–Cincinnati, OH

FELLOWSHIP:
Michigan State University–East Lansing, MI (Neuro-Ophthalmology); Wills Eye Hospital–Philadelphia, PA (Neuro-Ophthalmology); Jules Stein Eye Institute/UCLA–Los Angeles, CA (Ophthalmic Plastic Surgery)

ACADEMIC APPOINTMENTS:
Associate Professor, Ophthalmology & Visual Sciences–University of Utah School of Medicine

Dr. David Weinberg, Oculoplastic and Facial Plastic Surgeon and Neuro-Ophthalmologist, consults with residents and fellows.

Top: Cindy after surgery
Left: Cindy with Graves' Disease

Enhancing Eyes

Diagnosed with Graves' Disease, Cindy's eyes were so swollen and dry that she never went outside.

"I was a mole." That's how Cindy Adams describes her life two years ago. Diagnosed with Graves' Disease, Cindy's eyes were so swollen and dry that she never went outside. "It was too painful," she says. "I love to walk outside, but the sun and the wind hurt my eyes so much that I quit walking. I kept the shades drawn and my house was dark all day to keep the sun out. Even the smallest speck of dirt caused terrible pain. And the pressure always felt like someone had hit me in the eye."

Husband, Greg, describes his frustration. "We tried everything. Her eyes were so swollen that she couldn't close them at night. We even tried taping them shut, but it pulled the skin off her eyelids." Cindy is a school librarian and describes the embarrassment of having eyes that seemed to be bulging out. "Imagine 800 students making fun of you. Kids will be kids, and this was such an unusual sight for them."

Five surgeries later and you wouldn't even know Cindy had this problem. "In order to decrease the pressure on her eyes, we literally had to make room for them. Through a series of surgeries we enlarged her eye sockets," says Dr. Patel. Now not only does Cindy walk, but she enjoys riding her scooter to and from work.

Retinal Disease and Surgery

The Vitreoretinal Service at the Moran Eye Center is dedicated to excellence in diagnosis and both medical and surgical treatment of vitreous and retinal diseases.

SERVICES

- Retinaldetachment surgery
- Proliferativevitreoretinopathy
- Diabeticretinopathy
- Retinopathyof prematurity
- Posteriorsegment trauma
- Endophthalmitis
- Age-relatedmacular degeneration
- Retinalvascular disease
- Macularepiretinal membranes and macular holes
- Retinitispigmentosa and other hereditary retinal degenerations
- Intra-oculartumors
- Fundusphotography and angiography
- Digitaland indocyanine green (ICG) angiography
- Aand B ultrasonography
- Electroretinography(ERG)
- Electro-oculography(EOG)
- Visuallyevoked potentials (VEP)

Investigational studies in nutrition, as well as retinal pigment epithelial (RPE) cell transplantation surgery for macular degenerative diseases are ongoing.

Firefighter Steve Quinn continues to save lives.

Staying on the Job

Some professions by nature require high levels of visual ability: pilots, chauffeurs, and swat team members for example. Others allow adaptability to vision loss and blindness: teachers, attorneys, scientists, and many more. Steve Quinn's profession falls in the first group, he is a fireman/EMT.

"I was working one day and started seeing a little distortion," Steve says, "I thought it was just in the windshield of the vehicle I was driving. It got worse and worse and finally I knew I had to take care of it. I went to see a retinal specialist at the Moran Eye Center. I was diagnosed with ocular histoplasmosis syndrome."

"I work as a firefighter for the Unified Fire Authority and I was really concerned that I was going to lose my job. My department physical was coming up. I feared I might not pass. I'm a firefighter and an EMT paramedic. I work on a fire engine and we go on medical calls. In a fire you can't see anything anyway, so during those moments I would be okay, but the rest of the time, I could not afford to have my vision get worse."

Dr. Kang Zhang prescribed a regimen of surgery and specialized care and medicine. Through a series of injections and laser surgery he was able to bring Steve's sight back into a range that allowed him to easily pass his exam. I'm still on the force and my eyes are not changing," Steve says.

Dr. Zhang, a leading retinal expert, has been in the forefront of research on innovative diagnosis and treatment of conditions such as ocular histoplasmosis syndrome and wet macular degeneration. Research carried out by Dr. Zhang and his staff in the Zhang Laboratory at the Moran Eye Center is directly linked to novel diagnosis and effective treatment of a variety of leading causes of blinding retinal disorders. In this case the research translated to patient care–which translated to keeping one of our best firefighters on the job.

Paul S. Bernstein

Michael P. Teske

Albert T. Vitale

Kang Zhang

Paul S. Bernstein, M.D., Ph.D., clinical interests include age-related macular degeneration with special emphasis on the role of nutrition and environment in its treatment and prevention, inherited retinal and macular dystrophies, and surgical treatment of vitreoretinal disorders such as diabetic retinopathy and retinal detachments.

MEDICAL SCHOOL:
Harvard Medical School–Boston, MA

RESIDENCY:
Jules Stein Eye Institute, UCLA–Los Angeles, CA

FELLOWSHIP:
Massachusetts Eye & Ear Infirmary, Harvard Medical School–Boston, MA

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Michael P. Teske, M.D., is the Director of Vitreoretinal Diseases and Surgery. Dr. Teske specializes in medical and surgical diseases of the retina and vitreous. His primary surgical interests include retinal detachment, proliferative vitreoretinopathy, diabetic retinopathy, retinopathy of prematurity, epiretinal membranes, macular holes and posterior segment trauma.

MEDICAL SCHOOL:
University of California, Los Angeles Medical School–Los Angeles, CA

RESIDENCY:
University of Utah School of Medicine–Salt Lake City, UT

FELLOWSHIP:
Wayne State University–Detroit, MI

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Albert T. Vitale, M.D., specializes in the medical and surgical treatment of patients with vitreoretinal diseases. He is one of only a handful of people in the country with dual training in ocular immunology and inflammatory ocular disease as well as vitreoretinal surgery, and is the only provider of such expertise in the Intermountain West.

MEDICAL SCHOOL:
New York Medical College–Valhalla, NY

RESIDENCY:
St. Vincent's Hospital & Medical Center–New York, NY

FELLOWSHIP:
Harvard University, Massachusetts Eye and Ear Infirmary–Boston, MA

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Kang Zhang, M.D., Ph.D., an internationally known genetic researcher and clinician, is making it his lifelong goal to find a cure for macular degeneration and diabetic retinopathy. His clinical practice focuses on diagnosis and treatment of various vitreoretinal diseases, and he has special interests in new and innovative therapies for macular degeneration and diabetic retinopathy.

MEDICAL SCHOOL:
Harvard Medical School–Boston, MA; Harvard University–Boston, MA

RESIDENCY:
Johns Hopkins University's Wilmer Eye Institute–Baltimore, MD

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Adjunct Professor of Neurobiology & Anatomy; Director, Division of Ophthalmic Genetics; Co-director, Division of International Ophthalmology; Investigator, Program in Human Molecular Biology & Genetics; Eccles Institute of Human Genetics

Ophthalmic exams at the Moran Eye Center are thorough and comprehensive.

Comprehensive Ophthalmology

In addition to specialty care, the Moran Eye Center offers comprehensive eye exams that incorporate the full spectrum of eye conditions and problems. Patients can receive a thorough eye examination by an experienced board certified ophthalmologist and receive treatment if necessary, including all necessary follow-up care. If indicated by an examination, our patients can be referred to other Moran eye care sub-specialists for further evaluation and/or treatment. Our comprehensive ophthalmology team also performs ocular exams on patients with systemic diseases that may affect the eye, such as diabetes.

SERVICES

Eye exams by our comprehensive ophthalmologists cover evaluation of vision and testing for general eye health including common conditions such as:

- Glaucoma
- Cataracts
- Diseasesof the cornea and retina
- Problemswith the eyelids and areas around the eye
- Burns,tumors, injuries
- Visioncorrection needs and options

Moran's Comprehensive Ophthalmologists

Joseph L. Hatch

Nick Mamalis

Jean Tabin

Kim Y. Taylor

Joseph L. Hatch, M.D., provides expertise and experience in all areas of ophthalmology and has extensive experience in contact lens fitting. He was recently named to the prestigious Board of Directors of the American Medical Association Foundation.

MEDICAL SCHOOL:
Temple University School of Medicine–Philadelphia, PA

RESIDENCY:
Illinois Eye and Ear Infirmary–Chicago, IL

ACADEMIC APPOINTMENTS:
Adjunct Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

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Nick Mamalis, M.D., focuses his clinical practice on comprehensive Ophthalmology including cataract and other anterior ocular surgeries. As Director of the Ophthalmic Pathology Laboratory, Dr. Mamalis evaluates all specimens submitted to the laboratory. He is a member of the American Association of Ophthalmic Pathologists.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
Loyola University Medical Center–Maywood, IL

FELLOWSHIP:
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

Jean Tabin, M.D., provides general vision care and comprehensive ophthalmology services at the Moran Eye Center, Park City, Utah.

MEDICAL SCHOOL:
University of Medicine and Dentistry of New Jersey–Newark, New Jersey

RESIDENCY:
University of Medicine and Dentistry of New Jersey–Newark, New Jersey

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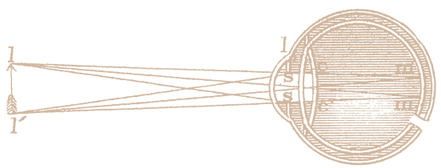
Kim Y. Taylor, M.D., provides general ophthalmology, with wide-ranging experience in cataract surgery and intra-ocular implants. He also has extensive experience in contact lens fitting.

MEDICAL SCHOOL:
University of Utah School of Medicine–Salt Lake City, UT

RESIDENCY:
University of California–San Francisco, CA

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine



Electrophysiology test being conducted by Dr. Creel.

Electrophysiology

The Electrophysiology Service at the Moran Eye Center provides diagnostic testing and evaluation of adults, children and infants with retinal anomalies and disorders of the optic nerve and tracts, brainstem and cortex.

SERVICES

- Fullfield electroretinogram (ERG)
- Multifocalelectroretinogram (mfERG)
- Patternor flash visual evoked response (VER)
- Electro-oculogram(EOG)
- Brainstemauditory evoked response (BAER)
- Contrastsensitivity
- Colorvision (Farnsworth D-15 and D-100)
- Saccadicvelocity

Moran's Electrophysiologist

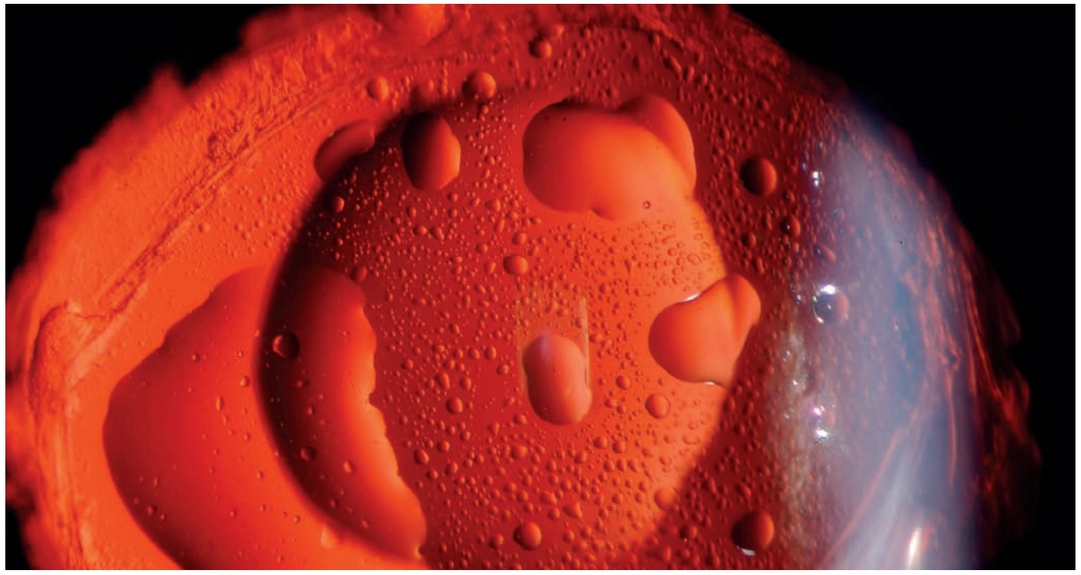
Donnell Creel

Donnell Creel, Ph.D., conducts electrophysiology testing on patients where this information will be helpful for a more accurate diagnosis. Research interests are application of electrophysiology of eye and brain as diagnostic tools, and the role of pigment in the development and function of the visual and auditory system.

EDUCATION:
University of Missouri–Kansas City, MO;
University of Utah School of Medicine–Salt Lake City, UT

ACADEMIC APPOINTMENT:
Research Professor of Ophthalmology & Visual Sciences, Neurobiology & Anatomy, Neuroscience–University of Utah School of Medicine

Ophthalmic Imaging and Videography



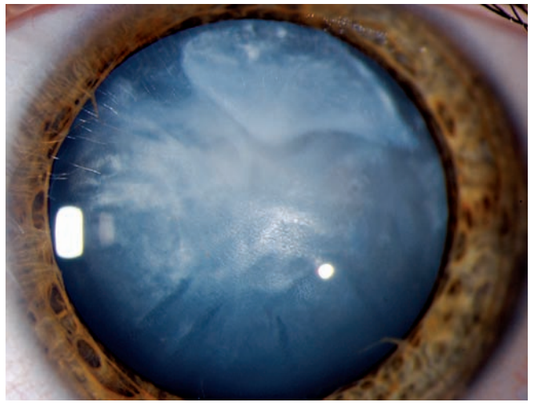
Silicone Oil Droplets

Ophthalmic Imaging is a special blend of photographic art and medical science that produces documentary or diagnostic images, directly contributing to the care of ophthalmic patients. The tools of light and exposure are used to create images that record and assist in the treatment of ocular conditions.

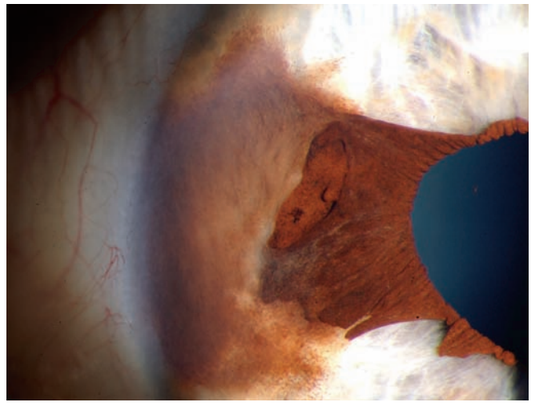
While Ophthalmic Imaging is based on the principles and techniques of film-based photography, the vast majority of images created at Moran are made electronically (digital imaging), allowing them to be networked, shared, enhanced and easily stored.

The Moran Eye Center is equipped with fundus cameras capable of performing color and black/white photography including angiography of the retina and choroid, with a slit lamp camera that can document the anterior portion of the eye, with scanning lasers that can perform high speed angiography or measure relative thicknesses of the retina and optic nerve, and with 35 mm digital SLR cameras for documenting external physical findings such as eye muscle imbalance, trauma or skin abnormalities. There are video cameras for filming pupil or eye movements, and for recording other body functions including head and facial movements and gait.

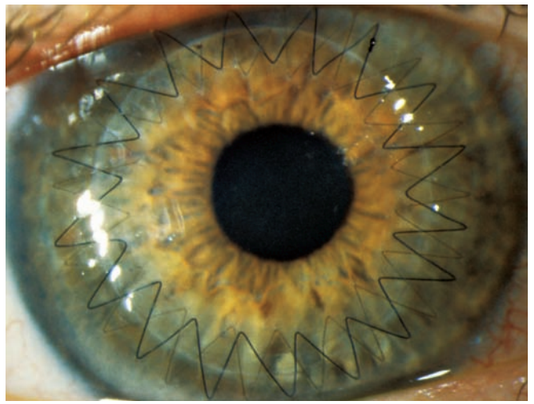
Ophthalmic images are integral in the practice of Ophthalmology. In cases of retinal or choroidal disorders, and in some neuro-ophthalmology cases, angiography provides the most critical information the physician needs to determine the diagnosis. Optical Coherence Tomography (OCT-a scanning laser procedure) provides documentation of the presence of fluid in the retina, verifying the efficacy of treatment. OCT also records retinal nerve fiber density for tracking the course of Glaucoma.



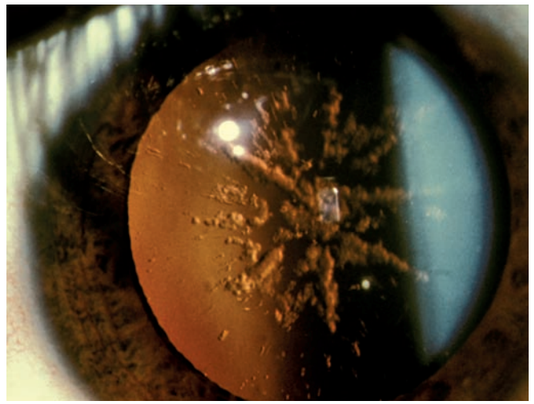
Hypermature cataract



Pigment overgrowth



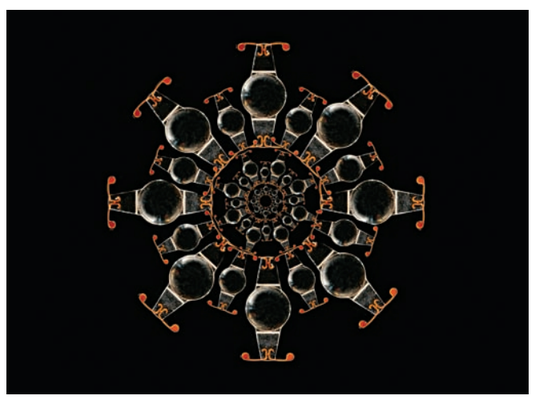
Corneal Transplant



Star cataract

All clinical images (which are medical records) produced by Moran Imaging or at the Moran Redwood Clinic, whether photographic studies or scans, are placed in an electronic database which can be remotely accessed by the physicians, significantly improving patient care and ease of preparing academic presentations.

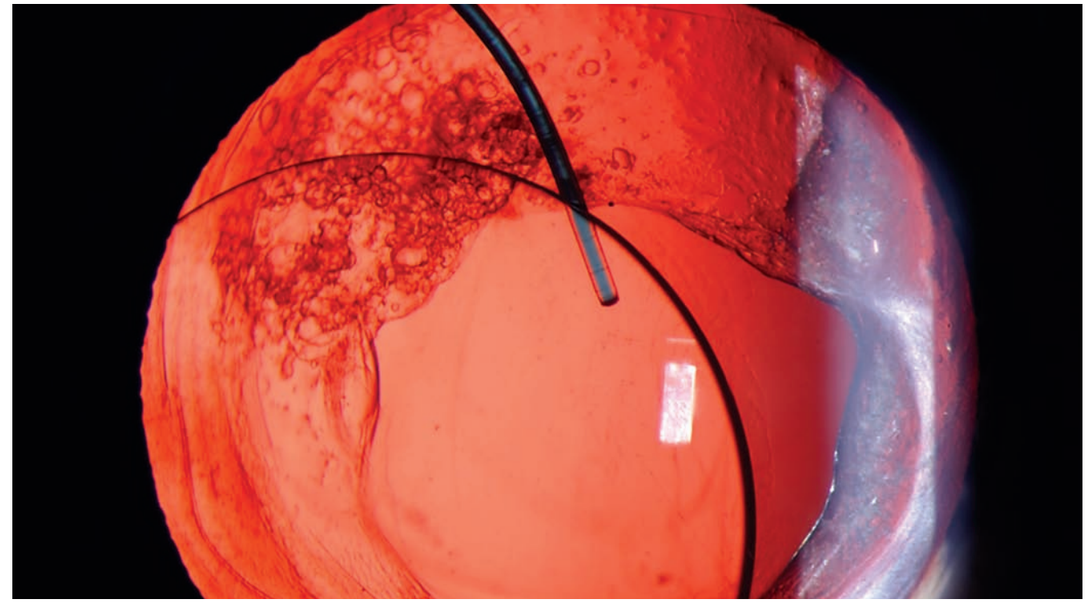
Moran Imaging supports the imaging needs of all the major Ophthalmic sub-specialties: Cornea and External Disease, Cataract and Anterior Segment Surgery, Glaucoma, Retinal Disease and Surgery, Uveitis, Neuro-Ophthalmology, General Ophthalmology, Pediatric Ophthalmology and Strabismus, Oculo-Plastic Surgery, and Optometry. The department provides imaging services for research through numerous Multi-Centered Clinical Trials, and documentation of projects generated by various Moran research laboratories.



The eye as art-IOL Crystalens

Clinical Research

Searching for Cures



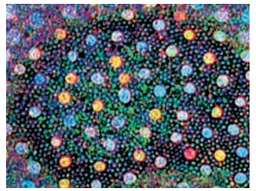
Retro dislodged IOL

Clinical faculty at the Moran Eye Center, participate in research that bridges the transition from the laboratory to the patient clinic. The purpose of clinical or biomediacl research is to increase understanding of disease processes, and improve and/or develop new methods of diagnosing, treating and preventing disease. Clinical trials involving patients are the only sure way to discover whether a new treatment is safe, effective, or better for the patient than other treatments. All clinical research performed at the Moran Eye Center undergoes prior review by the University of Utah ethics committee (Institutional Review Board) to assure that patients' rights and safety are protected, and clinical trial patients receive the highest quality medical care.

Clinical trials in vision research conducted at the Moran Eye Center have led to new medicines and surgeries that have saved or improved sight for countless patients. Numerous clinical trials conducted and ongoing include the study glaucoma, macular degeneration, dry eye, refractive surgery and disorders of the cornea, diabetic eye complications, inflammatory conditions of the eye, and neurological abnormalities of the eye. Our doctors were among the original investigators for a study funded by the National Eye Institute of the National Institutes of Health in 1985 to discover whether cryotherapy was a safe and effective treatment for a retina abnormality of premature infants. Our surgeons were early pioneers in improving cataract surgery through researching small incision surgery and use of topical anesthesia. They continue to study changes in intra-ocular lens designs. Doctors and clinical trial patients at the Moran Eye Center contributed to the research that recently resulted in FDA approval of a new drug for the management of wet age-related macular degeneration (AMD). In cases where eye diseases run in families, our researchers recruit thousands of people throughout the world and compile genetic information from blood samples to locate disease-causing genes. This is one of the avenues of research that will one day be the basis for curing these diseases.

RESEARCH

Basic research programs at the John A. Moran Eye Center span a range of vision-related topics, with the goals of understanding how the eye works and how we can better prevent, treat or even cure eye disease.



Multispectral imaging of cones

The Moran Eye Center is home to more than 43 faculty members, including one of the top retinal research teams in the world. Ocular studies being carried out at the Moran Eye Center receive widespread support from the National Institutes of Health (NIH), Research to Prevent Blindness, Inc., the Foundation Fighting Blindness, the Utah Lions Foundation, the National Society for the Prevention of Blindness, industry, private foundations and concerned and generous individuals. We are currently ranked 8th in the nation in annual NIH funding, with more than $6.8 million in grants. The Moran Eye Center also holds a prestigious National Eye Institute Vision Core Grant. Under the leadership of Dr. Randall J Olson, the Moran Eye Center is on the verge of an unprecedented research expansion.

The human body dedicates great resources to our gift of sight. Approximately one billion nerve cells in the brain are devoted to processing, storing, and/or transmitting visual information. Every tenth of a second, the retina sends 20 different images of the visual world to the brain, similar to watching 20 movies at once. And when any one of these many components malfunctions, the entire visual system is at risk. Understanding these systems at a basic physical, molecular and systems level is an incredible intellectual and technical challenge: one that inspires and motivates every researcher and clinician on the Moran Eye Center team.

NIH-funded research has shown that defects in over 500 different genes may cause inherited eye disease. The cumulative effect of aging is expected to lead to over 40 million cases of eye disease by 2020. Basic research programs at the John A. Moran Eye Center span a range of vision-related topics, with the goals of understanding how the eye works and how we can better prevent, treat or even cure eye disease.

In addition, our clinical research programs address such practical problems as intraocular lens design and compatibility, and the effects of diet on the onset and progression of certain retinal diseases. Moran researchers are involved in more than 36 active clinical trials and, through these trials, provide more than 3,000 clinical visits each year.

The Angelucci Laboratory

Structure and function of the Visual Cerebral Cortex

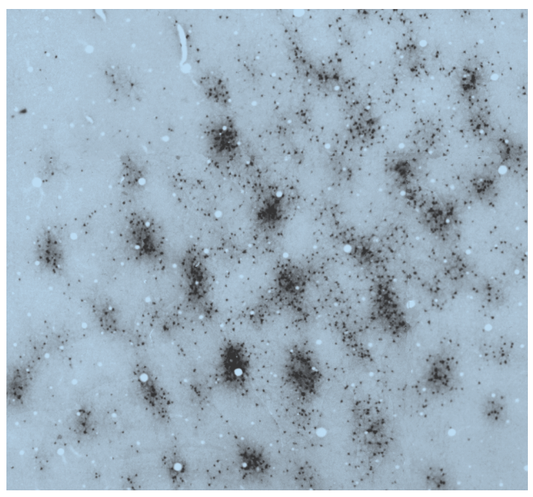
Alessandra Angelucci's research focuses on identifying neuronal circuits that underlie functional properties of neurons in the visual cerebral cortex and, ultimately, visual perception. The laboratory uses electrophysiological recording of cortical neurons and co-injecting neuroanatomical tracers to map neuronal response properties onto the underlying anatomical structure. To determine the broader functional organization of specific cortical circuits, optical imaging of neuronal populations is combined with injections of anatomical tracers.

At the early stages of visual processing, the retina and brain deconstruct visual scenes into a series of elementary features and attributes, such as color, orientation of line segments, direction of motion, ocularity and spatial location. These properties are segregated in different cortical areas. Research in the lab is currently directed towards understanding how and where in the visual cortex visual signals arising from distant locations in the visual world are integrated into a coherent percept. Specifically, we are studying neural circuits that might underlie long range interactions across visual space and their role in visual perception. A second major line of research is aimed at identifying neuronal circuits that mediate cross-talk between segregated functional streams specialized in processing visual attributes such as color, form and motion.

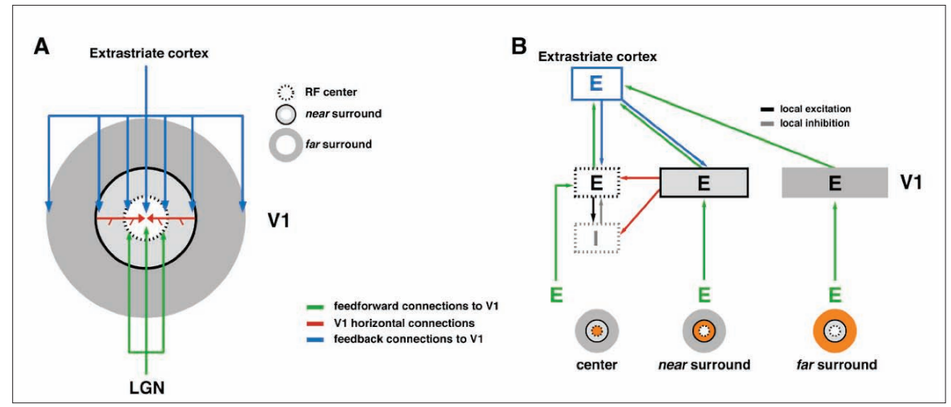
Neurons in visual cortex respond to stimuli in a small region of the visual space called the receptive field center. Visual stimuli outside the center (the surround) do not excite the cell, but can suppress the cell's response to visual stimuli in its RF center. The surround plays an important role in our perceptual ability to distinguish a visual object from background. Understanding the brain circuits that generate center and surround responses is an important step in understanding how the normal brain "sees" and what goes wrong when vision is impaired.

EDUCATION:
M.D., University of Rome, "La Sapienza," Italy
Ph.D., Massachusetts Institute of Technology, Cambridge, MA

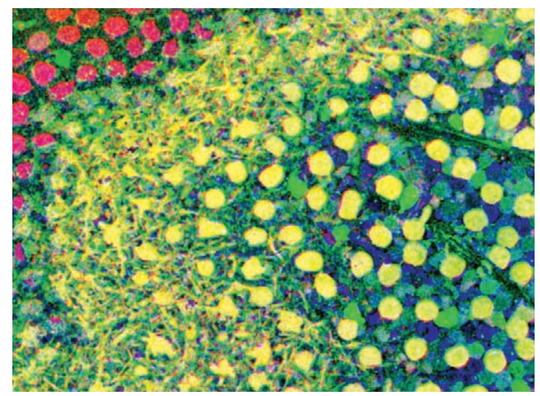
ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Adjunct Assistant Professor of Bioengineering



Patterns of feedback from higher cortical areas to visual cortex.



A. Circuits in the visual cortex that generate the receptive field center and surround of cortical neurons.
B. Neural network model of center-surround responses in visual cortex.



Neuronal patterns in the primate retina.

PATIENT CARE SIGNIFICANCE

Work in this laboratory is essential if we are to understand how vision actually occurs in the brain and how we might reproduce it. Retinal degenerations, glaucoma and eye traumas often produce such devastating eye damage that only a cortical prosthesis could restore vision. Our lack of knowledge of the complex organization of visual cortex and our inability to reproduce patterns of signaling required by cortex have prevented such "synthetic vision" from becoming a reality. The Angelucci Laboratory is the Moran Eye Center's lead in developing this knowledge, making us unique among eye centers world-wide.

A SAMPLE OF MAJOR PUBLICATIONS FROM THE ANGELUCCI LABORATORY

Lund J. S., Angelucci A., and Bressloff P. (2003) Anatomical substrates for functional columns in primary visual cortex. Cerebral Cortex, 12:15-24.

Angelucci A., Levitt J.B., Walton E., Hupé J.M., Bullier J. and Lund J.S. (2002) Circuits for local and global signal integration in primary visual cortex. J. Neurosci. 22: 8633-8646.

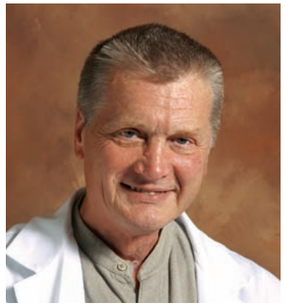
Angelucci A. and Bressloff P.C. (2006) The contribution of feedforward, lateral and feedback connections to the classical receptive field and extra-classical receptive field surround of primate V1 neurons. Prog. Brain Res. 154:93-121.

Angelucci A. and Sainsbury K. (2006) The contribution of feedforward thalamic afferents and corticogeniculate feedback to the spatial summation area of macaque V1 and LGN neurons. J. Comp. Neurol.: In Press.

Schwabe L., Angelucci A., Obermayer K. and Bressloff P.C. (2006) The role of feedback in shaping the extra-classical receptive field of cortical neurons: a recurrent network model. J. Neurosci. In press.

The David J. Apple Laboratory for Ophthalmic Devices Research

Moran's Primary Research Faculty



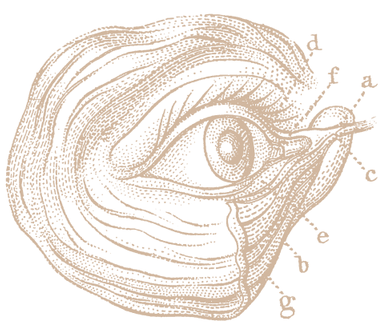
David J. Apple is recognized around the world for his contributions to ocular pathology and, in particular, for his work on intra-ocular lens explants. A noted international lecturer, Dr. Apple is the former chair of ophthalmology at The Medical University of South Carolina's Storm Eye Institute. In addition to his numerous honors, his textbook, Ocular Pathology, Clinical Applications and Self-Assessment, was first published over a quarter century ago and is now in its fifth edition. He is the author of more than 350 journal articles. He is also the first and only American citizen selected to present the "European Guest Lecture" at the Oxford Ophthalmological Congress in Oxford, England. He has received an Honorary Doctors Degree from the China Medical University, Peoples Republic of China, the first given in the specialty of ophthalmology from that institution. In 2003 he was elected to membership in the German Academy of National Sciences.

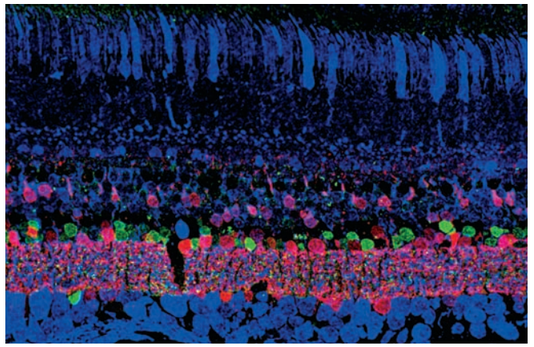
He is not only world-renowned in pathology and IOL research, but has studied refractive techniques including LASIK and has done pioneer studies on underprivileged world ophthalmology issues, especially cataract surgery. He is a consultant to Christoffelbliden Mission (CBM), a German-based nongovernmental organization dedicated to developing world eye care. His laboratory is an official Collaborating Center of the Prevention of Blindness Program World Health Organization (WHO). He has written a definitive monograph on techniques on cataract surgery in the Developing World.

During his first tenure at the University of Utah Dr. Apple established the Eye Pathology Laboratory, which continues today as the Apple Laboratory. He was one of the early faculty as the department began with Dr. Olson in 1979 and helped obtain initial funding from Research to Prevent Blindness, which also continues today.

EDUCATION:
M.D., University of Illinois College of Medicine, Chicago, Illinois

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Director of the David J. Apple Center for Ocular Biodevices





Neurotransmitters in the primate retina

PATIENT CARE SIGNIFICANCE

Each year approximately 1.4 million people in the United States receive intra-ocular lens (IOL) implants after surgical removal of cataracts. Though these replacement lenses improve vision, postoperative complications can occur. The Department of Ophthalmology and Visual Sciences in the University of Utah School of Medicine established a research program in 1984 to study the causes and origins of IOL-related complications. Research performed in this center has resulted in improved quality and design of IOLs, developed new surgical techniques now used by most implant surgeons, and spurred the withdrawal of poorly designed IOLs from the marketplace. We are now studying the causes, prevention, and treatment of posterior capsule opacification and development of IOLs from new soft biomaterials. The Center functions as a national registry for removed IOLs and eye tissue with lens-induced disease. Ophthalmologists worldwide have sent over 16,000 specimens to the center and many eye banks from around the nation regularly send tissues to the center for histopathological analysis.

The Center also conducts research on exciting new technologies. Incorrect IOL power is still a problem following otherwise successful cataract surgery. We have worked with the industry to develop a light adjustable lens which allows lens power to be changed following surgery while the implant is inside the eye.

Another major area of research is the development of an "accommodative" IOL. Currently, IOLs correct distance vision following cataract surgery, but do not allow many patients to have clear near vision for reading. Our clinician-scientists have worked with ophthalmic companies in the development of an accommodative IOL that can provide good distance and near vision.

Nick Mamalis, M.D., has directed the Intermountain Ocular Research Center, a nonprofit, independent laboratory that performs basic, in depth scientific research on intra-ocular lenses. In addition, the Center provides services and education to surgeons, clinical ophthalmologists, their patients, and intra-ocular lens manufacturers worldwide. The Moran Eye Center is now pleased to announce the formal merger of the Intermountain Ocular Research Center with the Apple Laboratory, to form the expanded David J. Apple Laboratories for *Ophthalmic Devices Research*.

EDUCATION:
M.D., University of Utah School of Medicine, Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Director of Ocular Pathology

Liliana Werner, M.D., Ph.D., joined the Moran Eye Center upon Dr. Apple's return. Dr. Werner's research is centered on the interaction between ocular tissues and different intra-ocular lens designs, materials and surface modifications. These include intra-ocular lenses implanted after cataract surgery, and also phakic lenses for refractive surgery and ophthalmic implantable devices in general.

EDUCATION:
M.D., University of Minas, Brazil; Ph.D., Biomaterials from the Université de Paris V (René Descartes), Paris, France

ACADEMIC APPOINTMENTS:
Research Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

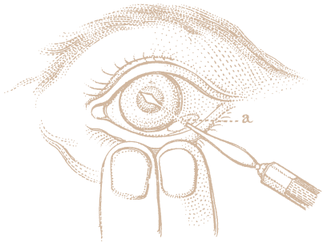
The Baehr Laboratory

Neurobiology of Disease and Molecular Neurobiology

Moran's Primary Research Faculty

Wolfgang Baehr was born in Mannheim, Germany, and studied organic chemistry at the University of Heidelberg. His career in retinal research was launched in the Department of Biochemistry, Princeton University, in 1976. Dr. Baehr was recruited from the Cullen Eye Institute at Baylor College of Medicine where he was a Jules and Doris Stein Research to Prevent Blindness Professor from 1987–1994, and joined the University of Utah Moran Eye Center as Professor of Ophthalmology and Director of our Foundation Fighting Blindness Center.

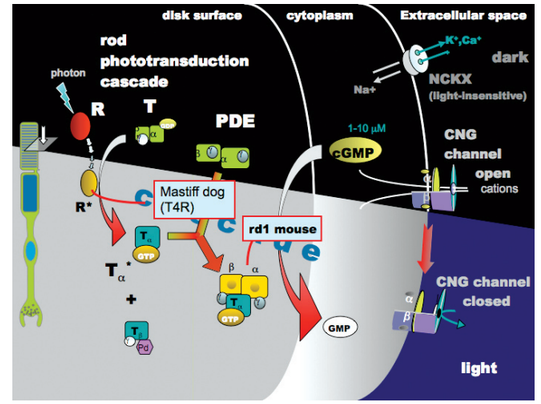
Dr. Baehr's career work addresses the biochemistry and molecular biology of the capture of light by photoreceptors in the eye (phototransduction), and the biochemistry of the key elements in that process (the Visual Cycle) with a focus on gene defects causative for human retinal disease. Dr. Baehr's early research generated one of the first transgenic mouse models for autosomal dominant retinitis pigmentosa, identified specific gene defects in several other animal models of human disease, and characterized key regulatory molecules in the phototransduction pathway. Dr. Baehr has published over 145 manuscripts covering topics in inorganic and organic chemistry, biophysics, biochemistry, molecular biology, bacteriology, infectious disease and genetics.



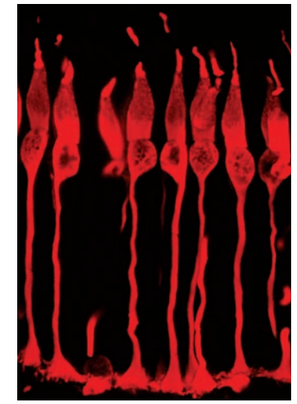
At the Moran Eye Center, Dr. Baehr's laboratory continues the hunt for genes implicated in blinding retinal degenerations using techniques from molecular biology, biochemistry, and neurobiology. In addition to the study of the 50-60 genes thought to be involved in rod and cone phototransduction, the laboratory is also tracking genes involved in the Visual Cycle. This pathway recycles nutritionally-derived Vitamin A aldehyde, the light-catching molecule or chromophore of photoreceptor cells, employing a complex export/import process between photoreceptors and the retinal pigmented epithelium.

EDUCATION:
Ph.D., University of Heidelberg, Germany

ACADEMIC APPOINTMENTS:
Ralph and Mary Tuck Professor of Ophthalmology & Visual Sciences; Director, Foundation Fighting Blindness Center at the John A. Moran Eye Center; Adjunct Professor of Neurobiology and Anatomy; Adjunct Professor of Biology



The transduction of light to chemical signals in the retinal photoreceptor cells.



Cone photoreceptors

A SAMPLE OF MAJOR PUBLICATIONS FROM THE BAEHR LABORATORY

Nishiguchi K. N., Sokal I., Yang L., Roychowdhury N., Palczewski K., Berson E. L., Dryja T. P., and Baehr W. (2004) A Novel (I143NT) Mutation in Guanylate Cyclase-Activating Protein 1 (GCAP1) Associated with Autosomal Dominant Cone Dystrophy. Invest. Ophthalmol. & Visual Science, 45:3863-3870.

Imanishi Y., Batten M. L., Piston D. W., Baehr W., and Palczewski K. (2004) Non-invasive two-photon imaging reveals vitamin A storage structures, in the eye. J. Cell Biol., 164:373-83.

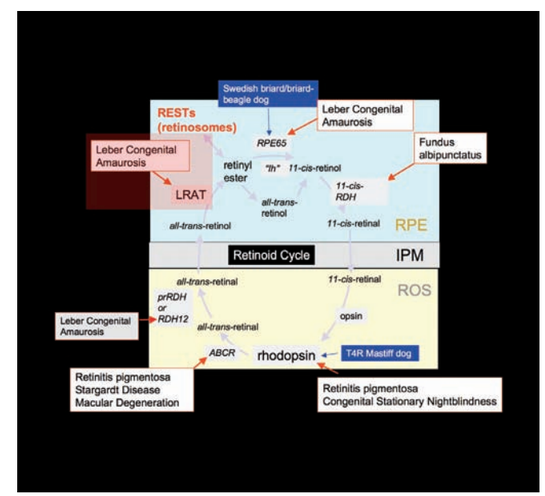
Zhang H., Liu X-H., Zhang K., Chen C.K., Frederick J. M., Prestwich, G. D., and Baehr, W. (2004) Photoreceptor cGMP Phosphodiesterase d-Subunit (PDEd) Functions as a Prenyl Binding Protein. J. Biol. Chem. 279:407-13. Epub 2003 Oct 15.

Batten M. L., Imanishi Y., Maeda T., Tu D., Moise A. R., Bronson D., Possin D., Van Gelder R. N., Baehr W., and Palczewski K. (2004) Lecithin: retinol acyltransferase (LRAT) is Essential for Accumulation of Retinyl Esters in the Eye and in the Liver. J. Biol. Chem., 279: 10422-10432. Epub 2003 Dec 18.

Howes K., Pennesi M. E., Sokal I., Church-Kopish J., Schmidt B., Margolis P., Frederick J. M., Rieke F. M., Palczewski K., Wu S. M., Detwiler P., and Baehr W. (2002) GCAP1 rescues rod photoreceptor response in GCAP1/2 knockout mice.

PATIENT CARE SIGNIFICANCE

The long-range goal of Dr. Baehr's research is to design strategies to ameliorate or cure human retinal degenerations: diseases for which no cures exist. These strategies are based on the discovery of many genes and their related proteins that malfunction in inherited retinal diseases. The complexities of these pathways means that designing curative gene therapies is a complex process requiring profound and accurate knowledge of the molecules involved and their many interactions. Dr. Baehr arguably heads the world's premier molecular genetics laboratory: the Moran Eye Center's lead team in discovering the mechanisms underlying incurable retinal diseases.



The Visual Cycle

Moran's Primary Research Faculty

The Bernstein Laboratory

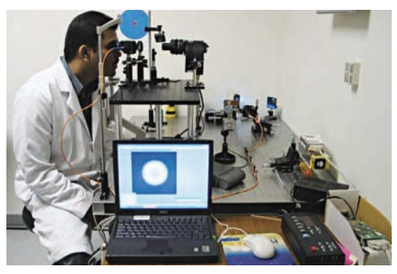
Retinal carotenoids and nutritional interventions in retinal disease

Paul S. Bernstein joined the faculty of the Moran Eye Center of the University of Utah in 1995, where he currently divides his time equally between basic science retina research and a clinical practice devoted to medical and surgical treatment of disease of the retina and vitreous, with special emphasis on macular and retinal degenerations. His academic training at Harvard University included a summa cum laude undergraduate degree in chemistry, a Ph.D. with Robert Rando, and an M.D. from the Division of Health Sciences and Technology, and a joint program between Harvard Medical School and MIT. He did a post-doctoral fellowship with Dr. Dean Bok in retinal cell biology and a residency in ophthalmology at the UCLA Jules Stein Eye Institute.

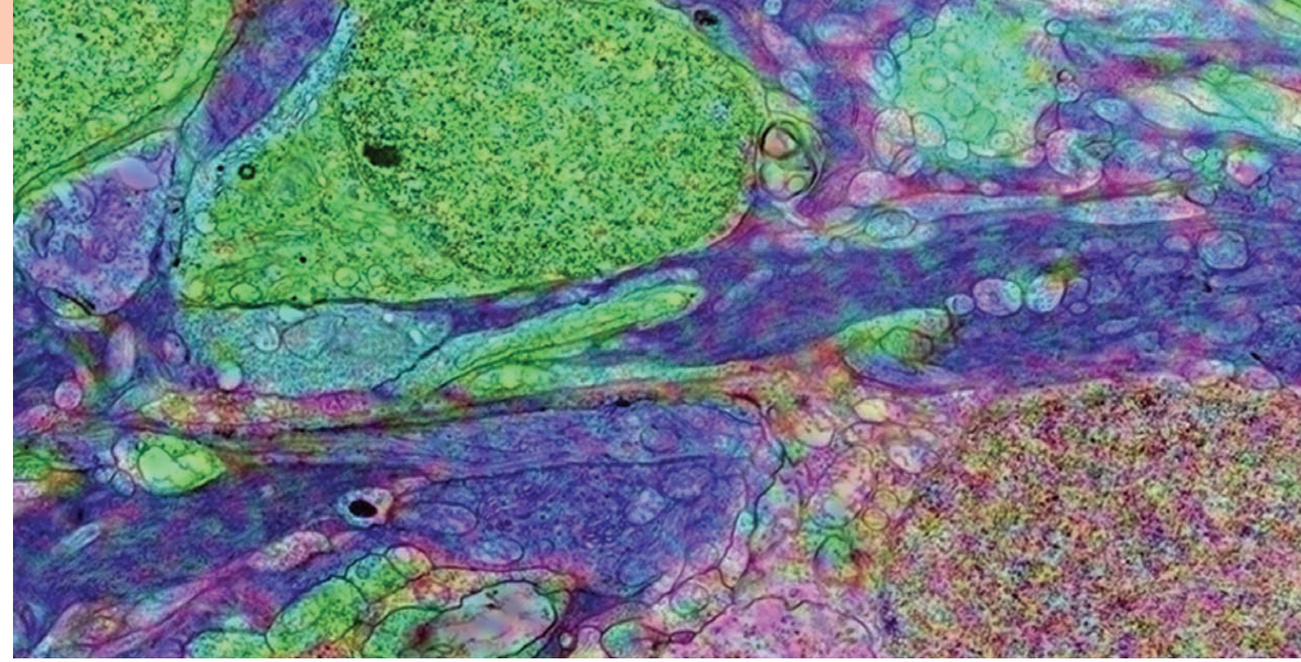
The Bernstein Laboratory explores the biochemistry and biophysics of nutritional interventions against inherited and acquired ocular disorders. His National Eye Institute funded laboratory is a leader in the study of the proteins involved in the uptake and stabilization of lutein and zeaxanthin in the human macula. These dietary xanthophyll carotenoids play an important role in protecting the macula from light induced oxidative damage, and high ocular levels are associated with decreased risk of age-related macular degeneration. In collaboration with Dr. Werner Gellermann of the University of Utah Physics Department, he has developed instrumentation to non-invasively measure carotenoid levels in the eye, skin, and other human tissues using resonance Raman spectroscopy. In addition to its important potential medical uses, this patented technology has been enthusiastically embraced by the nutritional supplementation industry—thousands of these Biophotonic Scanners® are in consumer use world-wide. Dr. Bernstein's Foundation Fighting Blindness research is devoted to the identification of genes associated with macular dystrophies and degenerations. He and his colleagues have helped to define the role of the ABCR and ELOVL4 genes in macular disease, and he has recently been able to demonstrate for the first time that high dietary intake of omega-3 fatty acids can protect against dominant Stargardt macular dystrophy (STGD3) in a large Utah family with an ELOVL4 mutation. Dr. Bernstein has authored over fifty peer reviewed research articles and reviews as well as six book chapters, and he has served as a reviewer for numerous journals, foundations, and institutes.

EDUCATION:
M.D., Ph.D., Harvard Medical School, Cambridge, MA

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Associate Professor of Pharmacology & Toxicology (Adjunct)



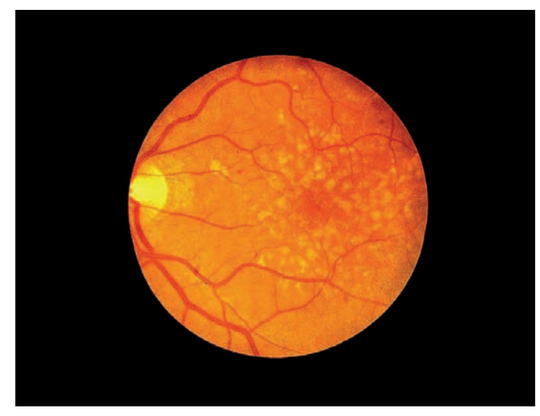
Bernstein Laboratory macular pigment measurement devices.



Molecular visualization mapped onto the ultrastructure of a degenerating retina.

PATIENT CARE SIGNIFICANCE

Dr. Bernstein's research has helped to establish the importance of lutein and zeaxanthin omega-3 fatty acids in the maintenance of macular health. He is currently the Moran Eye Center principal investigator for the National Eye Institute's AREDS II study, a nationwide multi-center clinical trial to establish definitive recommendations for nutritional interventions against age-related macular degenerations. In addition, his work on the mechanisms of action of proteins associated with major inherited form of macular degeneration offers hope that further molecular interventions are possible.



Retinal image of a patient with Stargardt macular dystrophy.

A SAMPLE OF MAJOR PUBLICATIONS FROM THE BERNSTEIN LABORATORY

Hubbard A.F., Askew E.W., Singh N., Leppert M., Bernstein P.S. (2006). Association of adipose and red blood cell lipids with severity of dominant Stargardt macular dystrophy (STGD3) secondary to an ELOVL4 mutation. Arch Ophthalmol, 124(2), 257-63.

Sharifzadeh M, Bernstein P.S., Gellermann W. (2006). Non-Mydriatic Fluorescence-Based Quantitative Imaging of Human Macular Pigment Distributions. J Opt Soc Am A, in press.

Bhosale P., Larson A.J., Frederick J.M., Southwick K., Thulin C.D., Bernstein P.S. (2004). Identification and characterization of a Pi isoform of glutathione S-transferase (GSTP1) as a zeaxanthin-binding protein in the macula of the human eye. J Biol Chem, 279(47), 49447-54.

Bhosale P., Bernstein P.S. (2005). Synergistic effects of zeaxanthin and its binding protein in the prevention of lipid membrane oxidation. Biochim Biophys Acta, 1740(2), 116-21.

McClane R.W., Gellermann W, Bernstein P.S.: (2006) Method and apparatus for Raman imaging of macular pigments. US Patent No. 7,039,452.

The Fuhrmann Laboratory

The Development of the Vertebrate Eye

Moran's Primary Research Faculty

Sabine Fuhrmann received her Ph.D. from the University of Freiburg in Germany and postdoctoral training at the University of Washington/Seattle, investigating the role of tissue-tissue interactions during early eye development. In 2000, she joined the faculty at the Moran Eye Center. Her laboratory studies the role of extra cellular signaling pathways in regulating patterning and differentiation of ocular tissues such as the neural retina and pigmented epithelium. The molecular signals that mediate these patterning events are largely unknown. Multiple congenital eye disorders, including anophthalmia, microphthalmia, aniridia, coloboma, and retinal dysplasia, stem from disruptions in early eye development. It is thus critical to define the signals that regulate normal patterning and development of the optic vesicle. The goal of Dr. Fuhrmann's research is to elucidate the cellular and molecular mechanisms that regulate the patterning and differentiation of ocular tissues using chick and mouse as model organisms.

EDUCATION:
Ph.D., University of Freiburg, Germany

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Adjunct Assistant Professor of Neurobiology & Anatomy

A SAMPLE OF MAJOR PUBLICATIONS FROM THE FUHRMANN LABORATORY

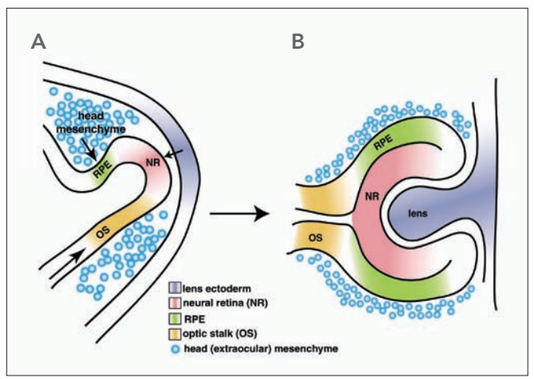
Seydewitz V., Rothermel A., Fuhrmann S., Schneider A., DeGrip W.J., Layer P., and Hofmann H.D. (2004): Expression of CNTF receptor A in chick violet-sensitive cones with unique morphological properties. IOVS 45(2): 655-661.

Fuhrmann S., Stark M., and Heller S. (2003): Expression of Frizzled genes in the developing chick eye. Mechanisms of Development/Gene Expression Patterns 3(5): 659-662.

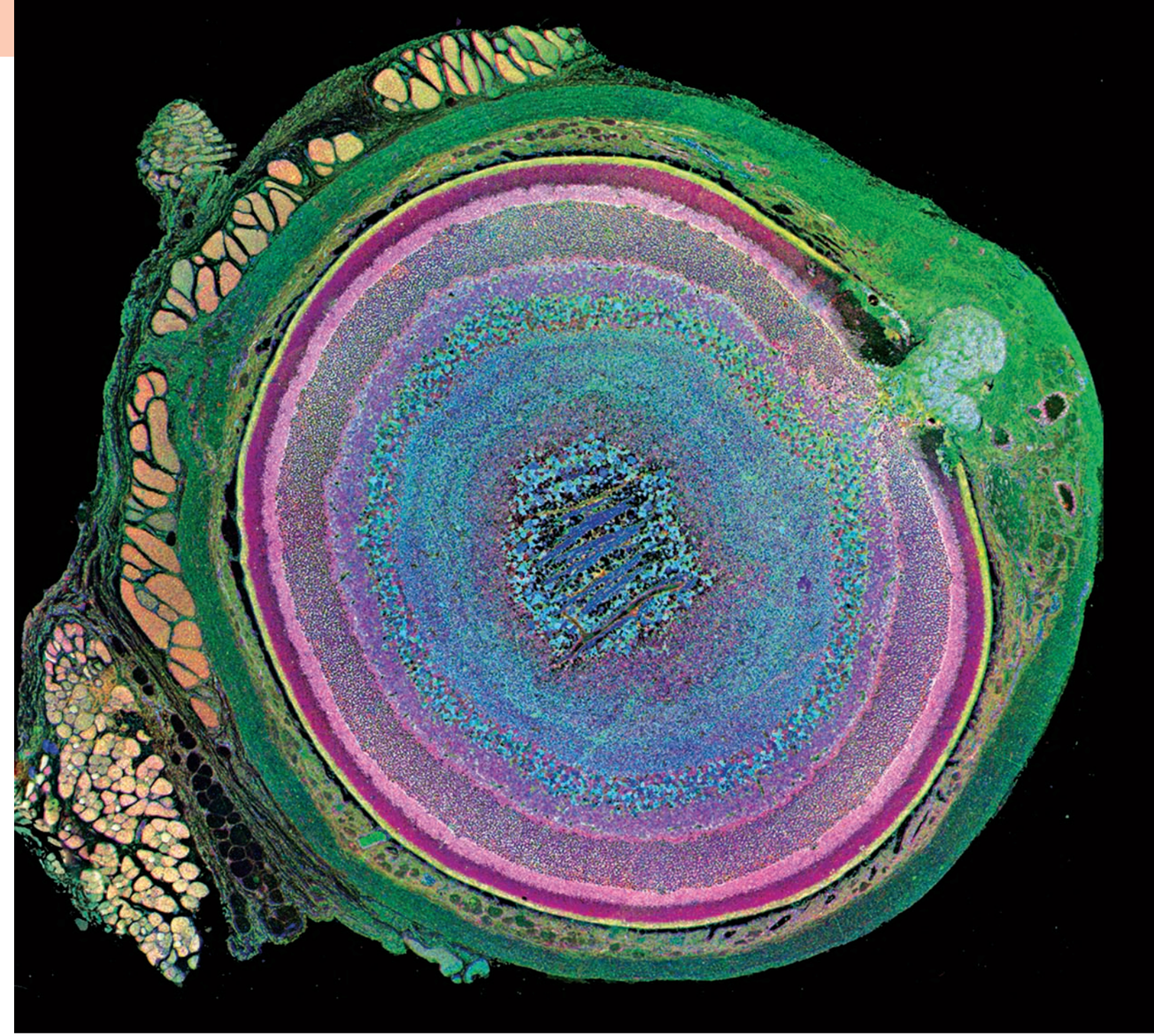
Fuhrmann S., Grabosch K., Kirsch M., and Hofmann H.D. (2003): Distribution of CNTF receptor A protein in the central nervous system of the chick embryo. J Comp Neurol 461: 111-122.

Fuhrmann S., Levine E.M., and Reh T.A. (2000): Extraocular mesenchyme patterns of the optic vesicle during early eye development in the embryonic chick. Development 127: 4599-4609.

Levine E.M., Fuhrmann S., and Reh T.A. (2000): Soluble factors and the development of rod photoreceptors. Cell Mol Life Science 57: 224-234.



Factors from surrounding tissues initiate patterning of the vertebrate eye.



Multispectral image of mouse eye and retina.

During development, complex patterning events generate distinct tissue components of the eye. Dr. Fuhrmann's lab has recently shown that tissues surrounding the embryonic eye control this development. Since signaling molecules like "TGFbeta" and "Wnts" control early patterning and differentiation of the brain and spinal cord, they are studying the role of these signaling molecules during early eye development using molecular genetics technologies, tissue culture and animal models.

PATIENT CARE SIGNIFICANCE

Many inherited and some induced eye defects arise in utero and lead to devastating blindnesses. At present there is neither any cure for such defects, nor are they easy to detect in advance. Dr. Fuhrmann's research is critical to the process of identifying genes associated with such events, and is the first step in defining points of potential intervention. The Fuhrmann Laboratory is the Moran Eye Center's lead team in identifying early eye gene defects and decoding their molecular interactions.

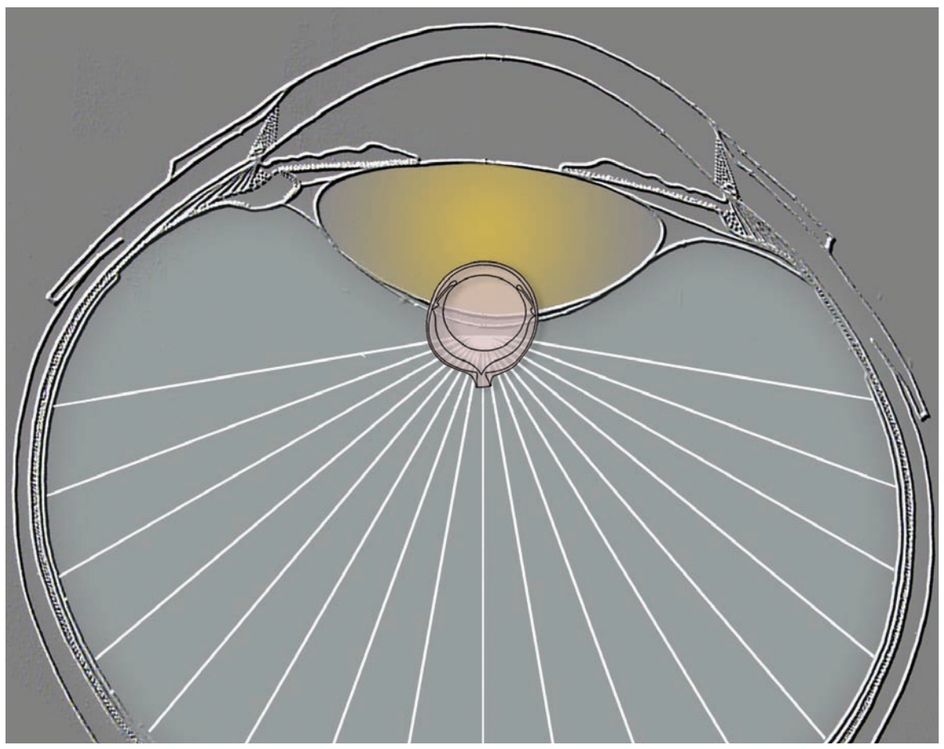
The Levine Laboratory

Molecular and Cellular Mechanisms of Retinal Development

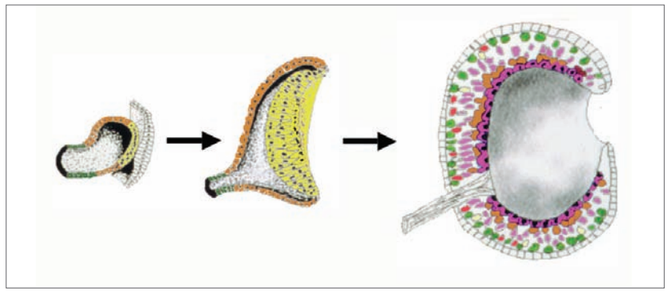
Edward Levine joined the Moran Eye Center in 2000. His laboratory is focused on understanding the molecular and cellular mechanisms of retinal development, as well as determining the contributions of developmental mechanisms to the progression and treatment of retinal degenerative diseases. His research uses the mouse retina because its developmental progression is well understood and several genetic models of retinal degeneration are available, thus facilitating the identification and characterization of important regulatory molecules. These studies enable direct tests of the roles of these molecules in retinal degenerations.

EDUCATION:
Ph.D., State University of New York, Stony Brook

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine



Mouse eye profile superimposed on human eye profile.



Vertebrate retinal neurogenesis

In the developing vertebrate retina, multipotential progenitor cells respond to environmental signals to expand the progenitor pool and generate one glial and six neuronal cell types. For this to occur, proliferation and differentiation must be balanced. The observation that cell cycle withdrawal precedes the onset of cellular differentiation suggests that the regulation of these processes is tightly linked. To address this, we are identifying the genes expressed in retinal progenitors that regulate the cell cycle and coordinate cell cycle withdrawal with the onset of differentiation.

PATIENT CARE SIGNIFICANCE

Once the retina is "built" from progenitor cells, the resulting neurons must survive for the life of the organism. Neurons do not replenish themselves. Many retinal diseases attack the neurons of the retina, leading to severe visual impairment and blindness. Understanding how retinal neurons cells are produced and differentiate may offer us the ability to build retinas anew, design novel synthetic retinas, or replenish populations of photoreceptor cells that have been depleted by retinal degenerations such as retinitis pigmentosa and macular degeneration. The Levine Laboratory has identified key genes that control the proliferation and differentiation of retinal progenitor cells and is studying ways to grow, harvest and use these cells. The Levine Laboratory is the Moran Eye Center's lead group for basic research on stem and progenitor cells in the retina.

A SAMPLE OF MAJOR PUBLICATIONS FROM THE LEVINE LABORATORY

Levine E. M., and Green E. S. (2004) Cell-intrinsic regulation of proliferation in vertebrate retinal progenitors. Seminars in Cell and Developmental Biology, 15:63-74.

Levine E. M. (2004) Cell cycling through development. Development, 131:2241-2246.

Green E. S., Stubbs J. L., and Levine E. M. (2003) Genetic rescue of cell number in a mouse model of microphthalmia: interactions of Chx10 with G1 cell cycle regulators. Development, 130:539-552.

Defoe D. M., and Levine E. M. (2003) Expression of the cyclin-dependent kinase inhibitor p27Kip1 by developing retinal pigment epithelium. Gene Expression Patterns, 3:615-619.

Cunningham J.J., Levine E. M., Zindy F., Roussel M. F., Smeyne R. J. The cyclin-dependent kinase inhibitors, p19Ink4d and p27Kip1, are co-expressed in select retinal cells and act co-operatively to control cell cycle exit. Molecular and Cellular Neuroscience (2002) 19:359-374.

One of two electron microscopes at the new Moran Eye Center.

The Marc Laboratory

Retinal Circuitry and Neurotransmission

Moran's Primary Research Faculty

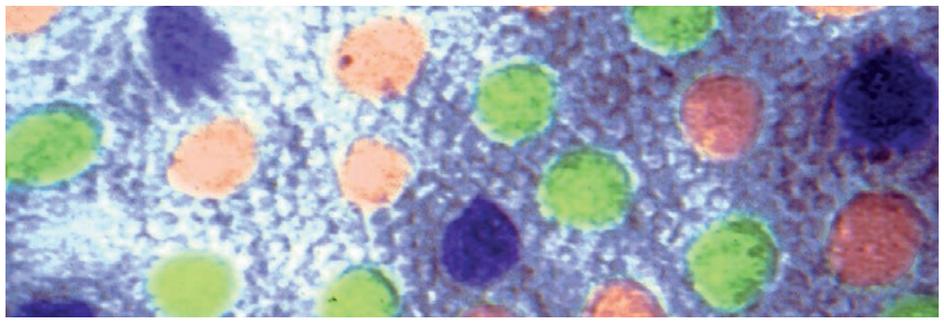
Robert Marc joined the Research Faculty of the Moran Eye Center in 1993 after 15 years at the University of Texas at Houston, where he was the Robert Greer Professor of Biomedical Science. Dr. Marc's early research provided the first maps of the different color varieties of photoreceptors in the retina. It is now clear that it is this unique pattern of color sensitive cones which dictates many features of our perception of color and form. And as retinal disease inexorably disassembles the retina, these exquisite sensors are often among the first to fail.

Dr. Marc's lab was also the first to provide rich molecular maps to visualize the nerve cell wiring patterns or "circuitry" of the retina responsible for the processes of seeing color, form and texture. These "molecular rainbows" helped uncover the diversity of nerve cells in the human retina. We now believe that nearly 80 different cell types (and thousands to millions of copies of each) are needed to assemble all of the networks for human vision. Along with other vision scientists such as Utah's Dr. Helga Kolb, Dr. Marc's analyses of wiring patterns are helping decipher the "neural code" underlying vision. This is a code we must fully understand if we are ever to build synthetic vision for the blind.

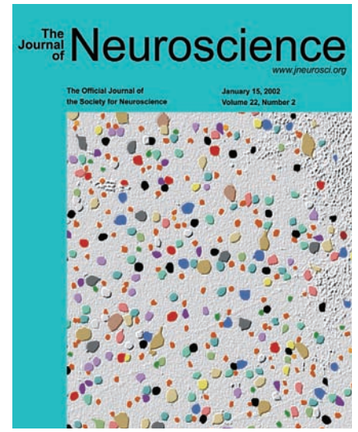
After 30 years of continuous NIH funding, Dr. Marc's laboratory now exploits advanced molecular detection, imaging, and computational technologies to produce new, richer visualizations of neurons and how they are connected. These new approaches allow the Marc Laboratory to track disruptions in these connections triggered by retinal diseases such as retinitis pigmentosa and macular degeneration. The ultimate goal of this research is to learn enough about the assembly, function and disassembly of these networks to guide the development of strategies to repair defects triggered by retinal diseases.

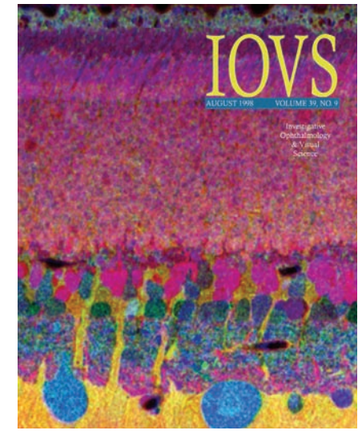
EDUCATION:
Ph.D., University of Texas Graduate School of Biomedical Sciences, Houston

ACADEMIC APPOINTMENTS:
Mary H. Boesche Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Professor of Physiology (Adjunct); Director of Research–John A. Moran Eye Center

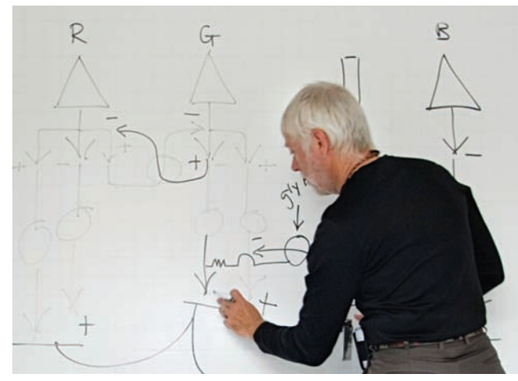


Primate red, green and blue cones for daylight vision surrounded by a sea of rods for night vision.





Molecular visualizations of retinal nerve cells from the Marc Laboratory have been featured on many journal covers.



Used for teaching and discovering, Dr. Marc requested several walls in his new Laboratory be made entirely of white board.

PATIENT CARE SIGNIFICANCE

Work in the Marc Laboratory has shown that many retinal diseases (retinitis pigmentosa, macular degeneration) lead to severe alterations in the wiring and survival of retinal neurons via a process known as remodeling. We also know that neurons unplug themselves permanently if the photoreceptors don't signal properly, resulting in rapid blindness. If we are to restore vision to the blind by genetic, molecular, cellular or even bionic therapies, this remodeling process must be controlled. It may even be exploited if we can learn how to steer neurons to the right targets and "plug in" anew. The Marc Laboratory is the Moran Eye Center's lead team in discovering the nature and scope of remodeling and searching for mechanisms to control or use it.

A SAMPLE OF MAJOR PUBLICATIONS FROM THE MARC LABORATORY

Marc R.E. (2006) Functional anatomy of the neural retina. Principles and Practice of Ophthalmology 3d Edition. Eds. Albert and Jakobiec.

Jones B.W., Watt C., Frederick J.M., Baehr W., Chen C.K., Levine E., Milam A., LaVail M.M., Marc R.E. (2003) Retinal remodeling triggered by photoreceptor degenerations. J Comp Neurol 464: 1-16.

Marc R.E., Jones B.W. (2002) Molecular phenotyping of retinal ganglion cells. J Neurosci 22:413-427.

Kalloniatis M., Marc R.E., Murry R.F. (1996) Amino signatures in the primate retina. J Neuroscience 16: 6807- 6829.

Marc R.E., Sperling H.G. (1977) The chromatic organization of primate cones. Science 196:454-456.

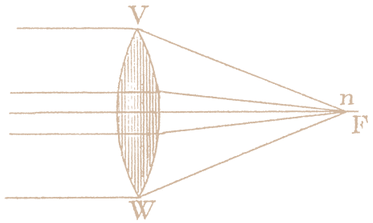
The Normann Laboratory

Artificial Vision

Moran's Primary Research Faculty

Richard A. Normann's research is directed towards the study of the vertebrate visual system and has both basic and applied elements. His basic research interests are focused on quantifying the extent and mechanisms underlying information processing in the retina and visual cortex using single cell intracellular recording techniques. He also studies the parallel processing of visual signals with high density, silicon based multi-electrode arrays. The cortical research also has an applied aspect: the micro electrode arrays that are currently being developed in his laboratory have application in the field of neuroprosthetics. The neural stimulation capabilities of these multichannel interfaces to the central nervous system might provide functional restoration of a limited visual sense to the profoundly blind or a limited sense of hearing to the deaf. Work ongoing in his laboratory is focused on testing these concepts.

The hope of artificial vision



The development of the Utah Artificial Vision System is guided by four principles: 1. Long-term safety and biocompatibility, 2. Vision capable of navigation without a guide dog, family member or friend, 3. Vision capable of reading printed text, and 4. A prosthesis that is as unobtrusive as possible. As a general high-level description, the Utah Artificial Vision System will consist of a micro-video camera hidden in a pair of eyeglasses to transform light in the visual scene into electrical signals, signal processing electronics to convert these signals into patterns of electrical stimulation for the brain as well as a power source carried in a shirt pocket, a totally implanted multichannel stimulator with data to be delivered to the system via a radio-frequency telemetry link, and an electrode array with 625 micro electrodes.

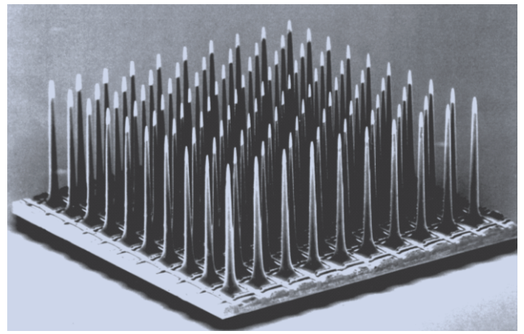
EDUCATION:
Ph.D., University of California, Berkeley

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Professor of Bioengineering

One of many new high tech, spacious laboratories in the research pavilion at the Moran Eye Center.

PATIENT CARE SIGNIFICANCE

Most retinal degenerations are irreversible, leading to profound visual impairment or total blindness. Glaucoma, optic nerve disease and eye trauma can all result in loss of vision from destruction of the retina or the axons connecting the retina to the brain. In all of these instances, the only possible option for restoring sight is to inform the brain directly about the visual world. Dr. Normann's groundbreaking research focuses on developing the technologies to do this, first by creating and validating new electrode technologies with which electrical signals can be precisely mapped onto the visual cortex, giving it an impression of the shapes, edges and movements of events imaged by cameras. This bionic vision, close to being a reality in the research lab, offers one of the brightest opportunities for soon restoring visual abilities to the sight-impaired.



Utah Slant Array

A SAMPLE OF MAJOR PUBLICATIONS FROM THE NORMANN LABORATORY

Badi A. N., Hillman T., Shelton C., and Normann R. A. (2002) A technique for implantation of a 3-dimensional penetrating electrode array in the modiolar nerve of cats and humans. Arch. Otoloryngol. Head Neck Surg. 128:1010-25.

Shoham S., Halgren E., Maynard E. M., and Normann R. A. (2001) Motor-cortical activity in tetraplegics. Nature Oct 25; 413(6858):793.

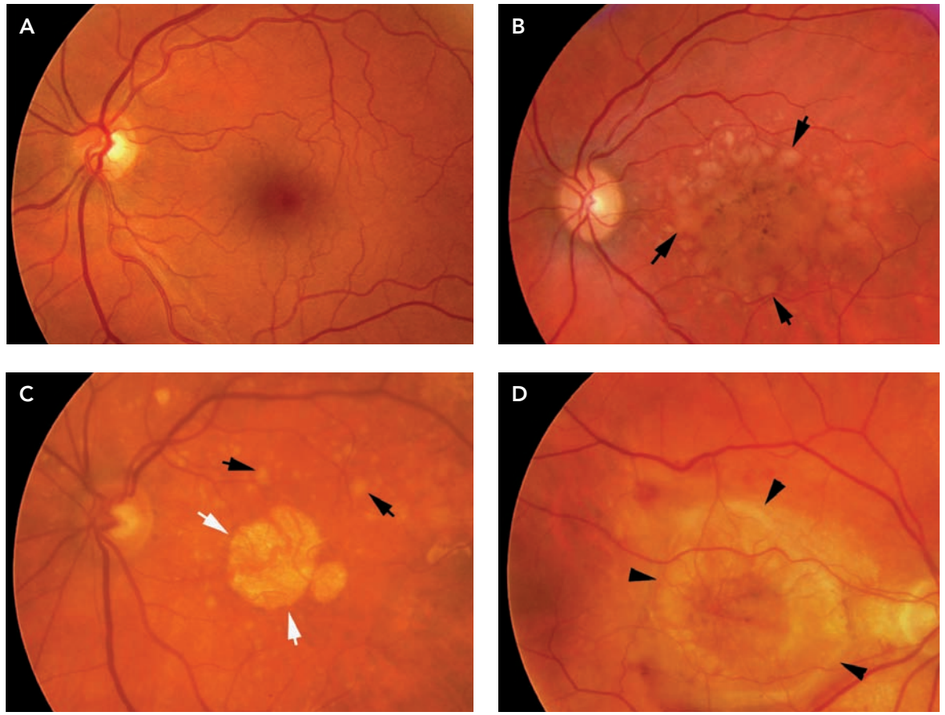
Warren D. J., Fernández E., and Normann R. A. (2001) High-Resolution Two-Dimensional Spatial Mapping Of Cat Striate Cortex Using A 100 Micro Electrode Array. Neuroscience 105(1):19-31.

Normann R. A., Warren D. J., Ammermüller J., Fernández E., and Guillory S. (2001) High-Resolution Spatio-Temporal Mapping of Visual Pathways Using Multi-Electrode Arrays. Vision Research 41:1261-1275.

Normann R. A., Maynard E. M., Guillory K. S., and Warren D. J. (1996) Cortical implants for the blind IEEE Spectrum May, pp. 54-59.

The Zhang Laboratory

Molecular Genetics and Functional Analysis of Retinal Disease



Fundus images of A, normal macula; B, macula with confluent soft drusen (black arrows); C, macula of dry AMD with geographic atrophy (white arrows) and soft drusen (black arrows); D, macula of wet AMD with a choroidal neovascular membrane (black arrow heads) and associated subretinal hemorrhage (white arrow). Photographs were provided by Kang Zhang, M.D., Ph.D., and James Gilman, CRA.

Kang Zhang is an internationally known genetic researcher and clinician, whose life goal is to find a cure for macular degeneration. Dr. Zhang, a U.S. citizen originally from China, joined the staff of the Moran Eye Center in 2002 from the Cleveland Clinic's Cole Eye Institute. He received his Ph.D. in genetics from Harvard in 1991 and his M.D. magna cum laude from Harvard Medical School in 1995. He completed his ophthalmology residency at the Johns Hopkins University's Wilmer Eye Institute in 1999. His laboratory at the Moran Eye Center is arguably the premier retinal disease gene screening group in the world.

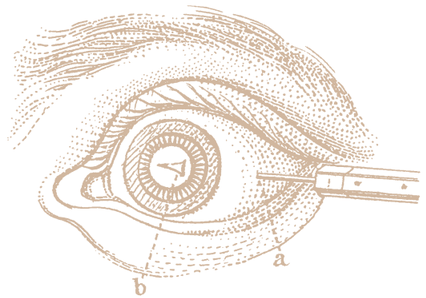
Dr. Zhang's research focuses on the use of molecular genetic techniques to identify genes that predispose a patient to age-related macular degeneration, and on developing drug therapies to prevent the disease. His goal is to identify patients who are most likely to develop the disease, and lower their risk, long before it becomes debilitating. The laboratory's research takes two approaches to uncover key genes and pathways in retinal degeneration. First, they use molecular tools to map and identify genes for important juvenile retinal dystrophies, including Stargardt disease, dominant familial drusen, retinitis pigmentosa, familial exudative vitreoretinopathy, pattern dystrophy, cone-rod dystrophy, Leber's congenital amourosis, optic atrophy and glaucoma. Second, they search for genes for age-related macular degeneration and glaucoma, two leading causes of blindness in the world. By exploiting the tremendous genetic resources of the University of Utah, particularly the Mormon genealogy records and Utah Population Databases of 1.6 million in size derived from 5500 founders, they are conducting genome-scans and association studies in large families.

EDUCATION:
M.D., Ph.D., Harvard University, Cambridge, MA

ACADEMIC APPOINTMENTS:
Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Adjunct Professor of Neurobiology & Anatomy; Director, Division of Ophthalmic Genetics; Co-director, Division of International Ophthalmology; Investigator, Program in Human Molecular Biology & Genetics; Eccles Institute of Human Genetics

PATIENT CARE SIGNIFICANCE

There has been an explosion in the discovery of genes associated with retinitis pigmentosa, macular degeneration and other eye diseases. Work in the Zhang Laboratory has been on the forefront of many of these. The design of medical and drug therapies to attenuate these complex diseases will require deep knowledge of how gene defects lead to cellular failure, so the analysis of genetic mechanisms of cell killing has been a major adjunct to screening for the genes themselves. The Zhang Laboratory stresses finding ways to predict and treat these diseases as early as possible, which is of the highest priority for the Moran Eye Center.



A SAMPLE OF MAJOR PUBLICATIONS FROM THE ZHANG LABORATORY

Magnusson K. P.*, Duan S., Sigurdsson H., Petursson H., Yang Z., Zhao Y., Bernstein P. S., Ge J., Jonasson F., Stefansson K., Helgadottin G., Zabriskie N. A., Jonsson T., Bjornsson A., Thorlacius T., Jonsson P. V., Thorleifsson G., Kong A., Stefansson H., Zhang K.*, Stefansson K., and Gulcher J. R.* (2006) CFH Y402H confers similar risk of soft drusen and both forms of advanced AMD. PLoS Med. 3:109-113. * co-corresponding authors

Karan G., Lillo C., Yang Z., Cameron D. J., Locke K. G., Zhao Y., Thirumalaichary S., Li C., Birch D. G., Volmer-Snarr H., Williams D. S., and Zhang K. (2005) Lipofuscin accumulation, abnormal electrophysiology, and photoreceptor degeneration in mutant ELOVL4 transgenic mice: a model for macular degeneration. PNAS, 102:4164.

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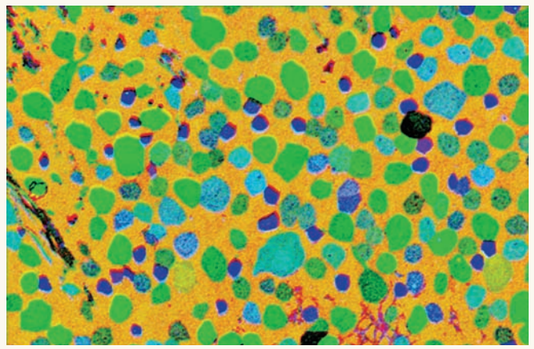
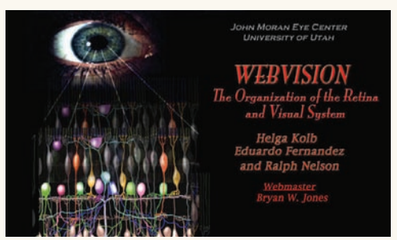
Helga Kolb is one of the most important retinal scientists of our time. Her work on the circuitry of the retina spans four decades and it forms an unrivaled blueprint for the flow of visual signals through the retina. One of the most highly cited vision scientists in the world, virtually all circuitry research derives from her discoveries.

In 1993 she was honored with the Proctor Medal, awarded by the Association for Research in Vision and Ophthalmology (ARVO); this is the most prestigious award in all of vision research and ophthalmology. In 2000, she received the Von Sallmann award from the International Society for Eye Research, in recognition of her many contributions to vision research over the course of her career. She is also an active member of the committee for the Helen Keller Prize in Ophthalmology.

Many of Dr. Kolb's important contributions to retinal research have been with her long-time collaborators, Dr. Ralph Nelson and Dr. Nicolas Cuenca. Dr. Kolb has authored circa 120 papers since 1962 on the neurocircuitry of the vertebrate retina. Her present emphasis is on writing papers, editing books, and creating an electronic book on the organization of the vertebrate retina and visual system. The electronic book can be found on the Internet at http://www.web-vision.med.utah.edu. This free electronic resource, hosted by the Moran Eye Center, is one of the crown jewels of electronic publishing and education at the University of Utah, with over 30,000 hits a day, and is widely cited by researchers world-wide. A "living" document, it is continually updated and revised to reflect new discoveries.



Ganglion cell patterns in retina



The Webvison site receives thousands of hits per day.

EDUCATION:
Ph.D., Bristol University, UK

ACADEMIC APPOINTMENTS:
Professor Emeritus of Ophthalmology & Visual Sciences–University of Utah School of Medicine

A SAMPLE OF MAJOR PUBLICATIONS FROM DR. KOLB

Kolb H. (2003) How the retina works. Am. Scientist, 91, 28-35.

Famiglietti E.V. and Kolb H. (1976) Structural basis for ON- and OFF center responses in retinal ganglion cells. Science, 194:193-195.

Kolb H. and Famiglietti E.V. (1974) Rod and cone pathways in the inner plexiform layer of the cat retina. Science, 186:47-49.

Jennifer Lund is one of the premier anatomists of our time. She is an internationally recognized neuroscientist whose research laid the groundwork for understanding signal flow into, within, and from visual cortex. Every major study of cortical physiology depends on her comprehensive maps of neuronal types and their intracortical projections. A graduate of University College, London University, Dr. Lund has served on the faculties of the University of Washington, Medical University of South Carolina, University of Pittsburgh, University of London and Cambridge University. She is a Fellow of the Academy of Medical Sciences and served on the Scientific Advisory Board for England's Medical Research Council. She has served as Chair of the Program Committee and Treasurer for the USA Society for Neuroscience, and Executive Secretary for International Brain Research Organization (IBRO). She is currently Secretary-General of IBRO.

Dr. Lund's research revealed, in detail, the tremendous diversity of cortical neuron types (a diversity greater than previously believed) and their remarkable specificities of interconnections. In landmark papers over the 1980's and 1990's she characterized how the form and patterning of each neuronal type potentially contributed to its cortical functions. She also pioneered studies of long-range interactions, where cells distant from a single cortical neuron influence its behavior.

EDUCATION:
Ph.D., University College London, UK

ACADEMIC APPOINTMENTS:
Professor Emeritus of Ophthalmology & Visual Sciences–University of Utah School of Medicine

A SAMPLE OF MAJOR PUBLICATIONS FROM DR. LUND

Lund J.S. (2002 Mar-Jun) Specificity and non-specificity of synaptic connections within mammalian visual cortex. J Neurocytol. 31(3-5): 203-9.

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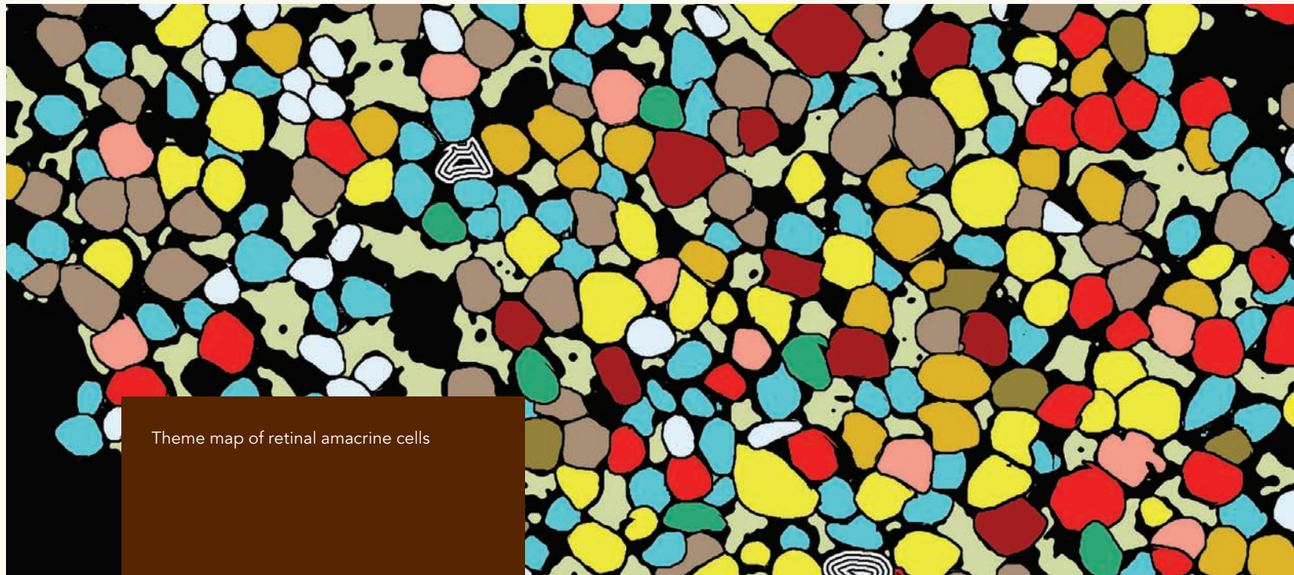
Lund J.S. (1988) Anatomical organization of macaque monkey striate visual cortex. Annu Rev Neurosci. 11:253-



Theme map of retinal amacrine cells

Raymond Lund has had an illustrious career in neuroscience, with over 400 career publications and service as chairman of three strong academic programs at the Medical University of South Carolina, the University of Pittsburgh and Cambridge University. Among his many awards and honors, he was one of the earliest recipients of a National Institutes of Health MERIT award. He also received the Edridge Green Medal from the Royal College of Ophthalmologists, and was elected a Fellow of the Royal Society (1992) and a Fellow of the Academy of Medical Sciences (1998).

His work spans half a century and ranges from fundamental studies of the organization of cortical and collicular visual pathways, to the first demonstrations that transplanted neuronal groups can rewire into the brain, and ultimately to the discovery that subretinal implants of engineered cells can provide protection against some forms of retinal degeneration.

Because degeneration of photoreceptors as a result of genetic defects affecting either the photoreceptors themselves or the associated retinal pigment epithelium represents the leading cause of blindness in humans for which no suitable treatment exists, these discoveries have been seminal and provide an opportunity to explore potential therapeutic approaches.

EDUCATION:
Ph.D., University College London, UK

ACADEMIC APPOINTMENTS:
Professor Emeritus of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Calvin and JeNeal Hatch Professor of Ophthalmology

A SAMPLE OF MAJOR PUBLICATIONS FROM DR. LUND

Coffey P.J., Girman S., Wang S.M., Hetherington L., Keegan D.J., Adamson P., Greenwood J. and Lund R.D. (2002) Long-term preservation of cortically dependent visual function in RCS rats by transplantation. Nature Neurosci. 5:53-56.

Lund R.D., Kwan A.S.L., Keegan D.J., Sauvé Y., Coffey P.J., Lawrence J.M. (2001) Cell transplantation as a treatment for retinal dystrophies. Prog. Ret. Eye Res. 20:415-449.

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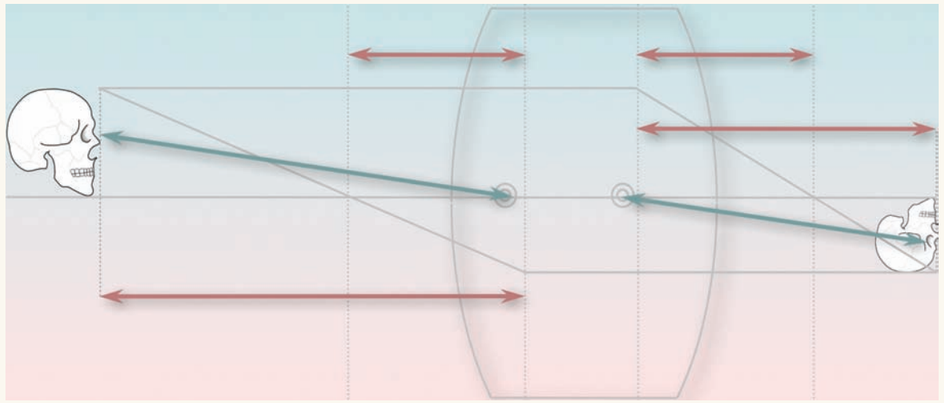
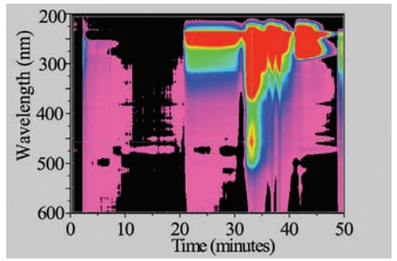


Thick lens ray tracing

Prakash Bhosale collaborates closely with Dr. Paul S. Bernstein. His major area of research includes purification, identification, and characterization of carotenoid binding proteins. These proteins are critical elements in capturing and delivering essential nutrients to the eye and photoreceptors in particular. He has identified proteins from the human macula that capture the nutrient zeaxanthin for retinal cells. This process may be essential in protecting cells from the stresses that lead to macular degeneration.

EDUCATION:
Ph.D., University of Pune, India

ACADEMIC APPOINTMENTS:
Research Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

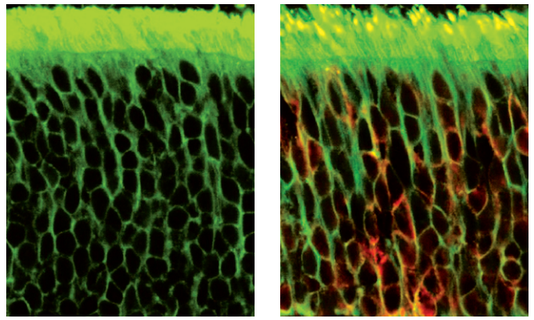


Carotenoid binding proteins from retina monitored using photodiode detector.

Jeanne Frederick studies the organization of the retina in health and disease using the transgenic and knockout/knock-in mice carrying mutations in genes linked to retina dystrophies. The key focus is on transformations of rod and cone photoreceptors that lead to cell death. In several neurodegenerative diseases, improperly shaped proteins, such as misfolded rhodopsin (the molecule responsible for night vision) accumulate as insoluble inclusions and may serve a critical role in disease progression.

EDUCATION:
Ph.D., University of Wisconsin, Madison, WI

ACADEMIC APPOINTMENTS:
Research Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine



Human parafoveal macula showing labeling for cone photoreceptors (green) and a zeaxanthin-binding protein (GSTP1, red) thought to be protective against photo-oxidation. Cones convey color vision and are responsible for high-acuity. This confocal microscope image shows peripheral-to-central gradation to robust GSTP1 immunolabeling of the inner retina, a pattern consistent with the known distribution of human macular carotenoid pigment.

Kimberly Howes received her Ph.D. in Cellular and Structural Biology at the University of Texas Health Sciences Center at San Antonio, Texas. In her thesis project, she examined the role of tumor suppressor genes in the development of the eye cancer called retinoblastoma. She continued her retinal studies under the tutelage of Dr. Wolfgang Baehr, where she studied the molecular regulation of photorecovery pathways. She is currently working independently to study retinal aging and activating pathways which predispose individuals to developing dry form age-related macular degeneration (AMD). Her work focuses on the role of advanced glycation end products and their receptors as mediators of chronic inflammatory responses in the aging retina. She is also working in collaboration with Dr. Kang Zhang on retinal neovascular disorders such as retinopathy of prematurity, proliferative diabetic retinopathy, and choroidal neovascularization occurring in the wet form of AMD.

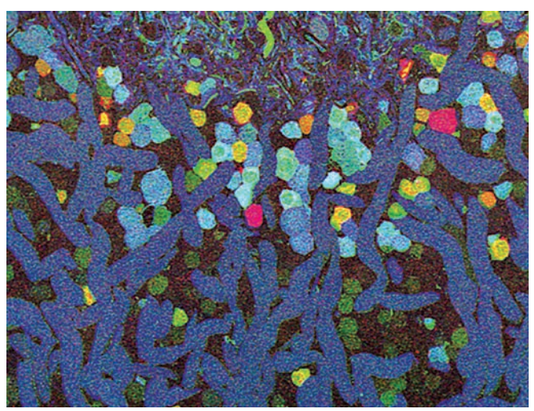
EDUCATION:
Ph.D., University of Texas Health Sciences Center, San Antonio

ACADEMIC APPOINTMENTS:
Research Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

Bryan William Jones joined the Research Faculty of the Moran Eye Center in 2006. Originally coming to science through the study of epilepsy and sleep medicine, he became fascinated by the beauty of the retina and the complexity of blinding diseases. His work in the laboratory of Dr. Robert E. Marc revealed the nature and extent of pathology seen in retinal degenerative diseases such as retinitis pigmentosa and macular degeneration, now known as retinal remodeling. This work helped to refine approaches to vision rescue through both bionic and biological approaches. Continued work will further define the time lines of retinal remodeling in an effort to determine windows of opportunity for intervention to limit, prevent or exploit retinal remodeling. Other work in the Marc Laboratory focuses on applying novel molecular and computational approaches to resolving the identities and connectivities of neurons in the retina to discover how the normal retina is wired, how that circuitry is altered in degenerative diseases, and how to potentially engineer artificial biological retinas.

EDUCATION:
Ph.D., University of Utah, Salt Lake City

ACADEMIC APPOINTMENTS:
Research Assistant Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine

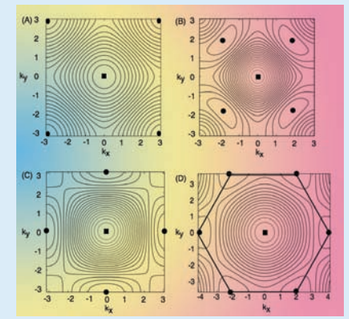


Neurochemical imaging of the retinal inner nuclear layer

Paul Bressloff explores a range of visual processes using mathematic and simulation tools. In a strong collaboration with the Angelucci Lab, they have developed new "recurrent network models" for visual cortex that may explain how we see objects as separate from complex backgrounds. The Bressloff group also studies cortical development by creating activity-based models of the self-organization of visual cortex into functional modules. These studies provide novel opportunities to identify hidden features of cortical systems for further physiological and anatomic analysis.

EDUCATION:
Ph.D., Department of Mathematics, King's College, London University, England

ACADEMIC APPOINTMENTS:
Professor of Mathematics; Professor of Ophthalmology (Adjunct)–University of Utah School of Medicine

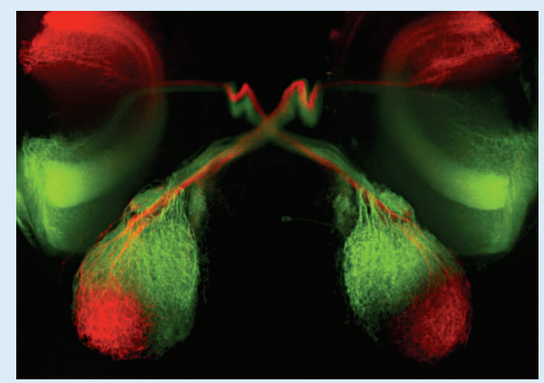


Maps of recurrent pathways in visual cortex.

Chi-Bin Chien studies the genes and cell behaviors of axon guidance, the process by which the developing ganglion cells of the retina find the brain. Imagine trying to find your way from the University to downtown Salt Lake on foot, using only short-range senses (smell, touch, and taste, eyes closed). This gives an idea of the task faced by a growing axon in the developing brain. The growing tip of the axon, the growth cone, has to navigate a long way across complex terrain in order to connect up with its target neurons. The Chien Lab studies pathfinding genes and molecules using time-lapse microscopy of living axons as they navigate to the brain. The next step is to understand how these genes work.

EDUCATION:
Ph.D., California Institute of Technology, Pasadena

ACADEMIC APPOINTMENTS:
Associate Professor of Neurobiology & Anatomy; Adjunct Associate Professor of Ophthalmology–University of Utah School of Medicine



Fluorescent image of the visual system of a zebrafish larva, showing axons extending from both eyes into the brain.

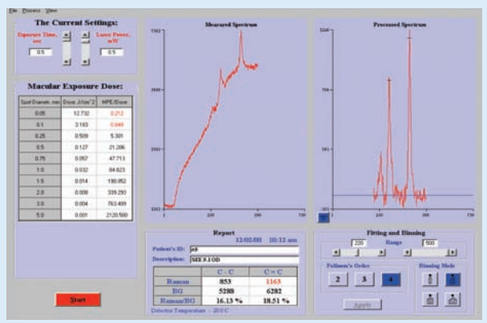
Moran's Adjunct Faculty

University of Utah campus

Werner Gellermann is a member of the condensed matter physics group studying the optical properties of solids, specifically laser properties. His experience with resonance-Raman spectroscopy has led to an extremely fruitful collaboration with Dr. Paul Bernstein of the Moran Eye Center, where they have developed instrumentation to measure carotenoid levels noninvasively in the eye, skin, and other human tissues using resonance Raman spectroscopy. This has been an important advance in monitoring the risk and disease progression in macular degeneration.

EDUCATION:
Ph.D., University of Utah, Salt Lake City, UT

ACADEMIC APPOINTMENTS:
Research Professor of Physics, Professor of Ophthalmology (Adjunct)–University of Utah School of Medicine

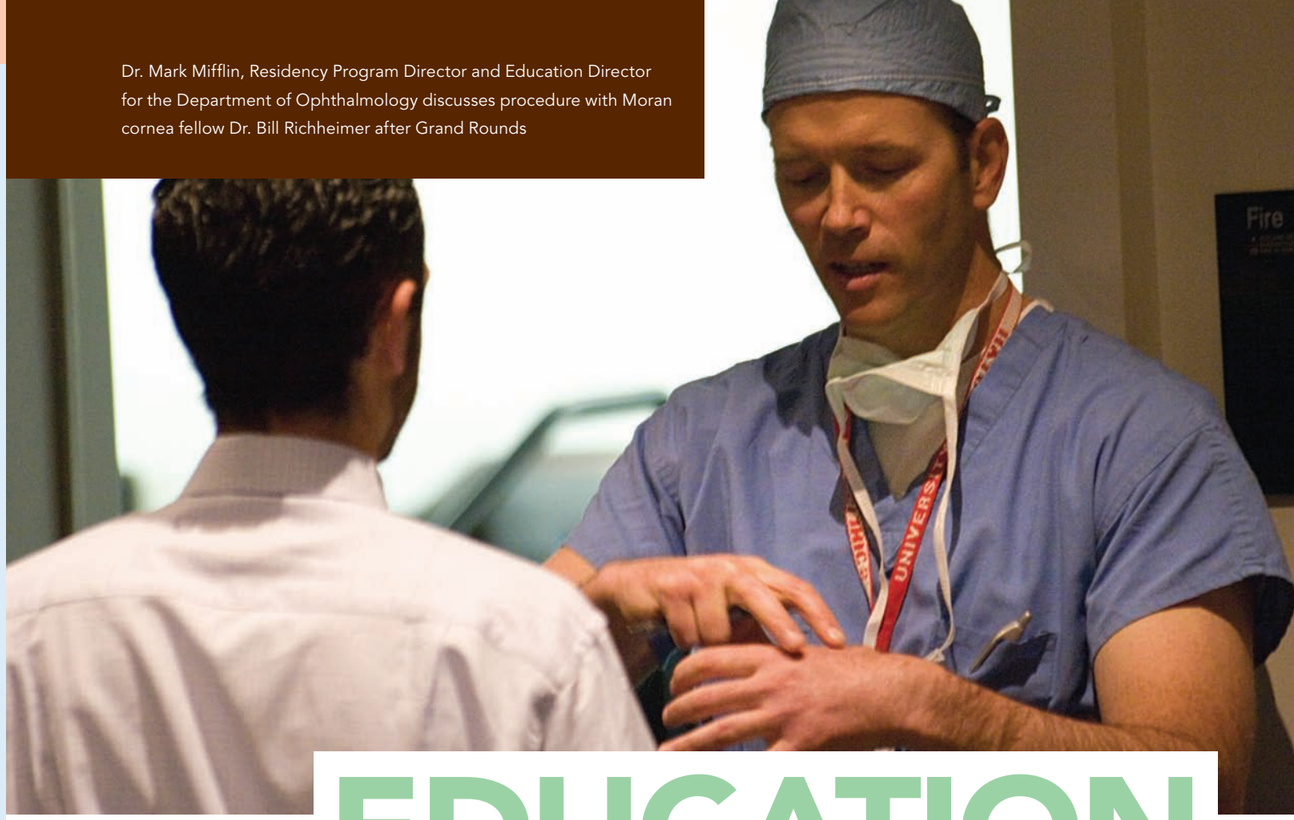


Macular pigment levels in the eye.

Monica Vetter explores how developing retinal neurons differentiate into specific, mature neuronal types to form a coherent, functioning retina. A key goal in the lab is to understand the interplay between intrinsic factors that regulate neural differentiation and extrinsic signaling pathways that modulate their expression or function, as well as also exploring the mechanisms driving neuronal pathology in retinal disease. There may be shared molecular pathways involved in both neural development and degeneration.

EDUCATION:
Ph.D., University of California, San Francisco, CA

ACADEMIC APPOINTMENTS:
Professor of Neurobiology & Anatomy; Professor of Ophthalmology (Adjunct) Visual Sciences–University of Utah School of Medicine



Dr. Mark Mifflin, Residency Program Director and Education Director for the Department of Ophthalmology discusses procedure with Moran cornea fellow Dr. Bill Richheimer after Grand Rounds

EDUCATION

We are consistently ranked as one of the top ten ophthalmology education programs in the United States.

For more than a quarter century, the ophthalmology program at the University of Utah School of Medicine has offered excellent didactic training and extensive surgical experience. Each year, faculty from the Moran Eye Center provide ophthalmology training to more than 150 medical students, as well as three interns, nine residents five fellows and six international fellows. As the only medical school in the Mountain West, the University of Utah plays an important role in training the region's next generation of physicians and ophthalmologists.

More than 300 applications are received each year for the center's highly coveted residency and fellowship positions. We are consistently ranked as one of the top ten ophthalmology education programs in the nation. Our faculty covers all subspecialty areas of ophthalmology. Our clinician educators have very active practices and residents have access to all patients in our system.

The John Moran Eye Center residency program is fully re-accredited by the ACGME. With the opening of the new 210,000 square foot John A. Moran Eye Center in 2006, our residents are learning hands-on in a state-of-the-art facility that is truly one of the great eye-centers in the world.

We operate our educational programs in conjunction with the 400-bed University of Utah Hospital and the 121-bed Salt Lake Veterans Administration Medical Center. Additional training is conducted at Primary Children's Medical Center. All fellowships have been designed to mesh perfectly with our residency in a way that enhances the entire experience.

Fellowship Programs

Moran Resident Stacy Smith presenting at weekly Moran Eye Center grand rounds.

Drs. Mamalis and Weinberg talking with Moran Fellows, Darcy Wolsey, Allan McInnis.

The Moran Eye Center offers the following Fellowship programs:

CORNEA/REFRACTIVE SURGERY FELLOWSHIP PROGRAM

The major emphasis for this fellowship is on the medical and surgical treatment of cornea and external diseases, as well as extensive experience in LASIK and other refractive surgery. The fellow works closely with Randall J Olson, M.D., Professor and Chairman; Mark D. Mifflin, M.D., Associate Professor, Residency Program Director and Education Director for the Department of Ophthalmology; Majid Moshirfar, M.D., Professor, and Geoffrey Tabin, M.D., Professor. A significant number of anterior surgical cases are performed.

GLAUCOMA FELLOWSHIP PROGRAM

This fellowship provides a very busy clinical exposure to all aspects of glaucoma with a heavy emphasis on surgical treatment. A large number of glaucoma procedures as well as phacoemulsification will be part of this surgical experience. The fellow will work closely with Alan S. Crandall, M.D., Professor, Norman A. Zabriskie, M.D., Associate Professor, and Jason Goldsmith, M.D., Assistant Professor. Teaching responsibilities as well as clinical research are part of this fellowship.

OPHTHALMOLOGY INTERNATIONAL FELLOWSHIP PROGRAM

The International Fellowship Program provides a very busy observational exposure in clinical settings to all aspects in the ophthalmology subspecialty requested.

NEURO-OPHTHALMOLOGY FELLOWSHIP PROGRAM

This program provides a very busy clinical exposure to all aspects of Neuro-Ophthalmology with an emphasis on diagnosis and treatment of neuro-ophthalmic disorders. The fellow will also be expected to participate in clinically related research as well as teaching responsibilities. The fellow works with Kathleen Digre, M.D., Professor; Judith Warner, M.D., Associate Professor; Bradley Katz, M.D., Ph.D., Assistant Professor; and David A Weinberg, M.D., Associate Professor.

RETINA FELLOWSHIP PROGRAM

This two-year retina fellowship offers the chance to work with four full-time retina faculty–Michael Teske, M.D.; Paul Bernstein, M.D., Ph.D.; Kang Zhang, M.D., Ph.D., and Albert Vitale, M.D. They will provide extensive hands-on training in adult and pediatric vitreo-retinal surgery, medical retina, and posterior uveitis at three busy teaching hospitals–Moran Eye Center, Salt Lake City VA, and Primary Children's Hospital.

Above: John's 50-year-old oak tree blown over
Right: John DellaCroce

A Hurricane Won't Stop Me

He had no money. What happens to a guy like that when a hurricane hits? He's not going to ride his bike out of the city.

Tulane University Hospital after hurricane Katrina

On August 29, 2005, the thought of doing a three-year retinal fellowship in Utah had not crossed Dr. John DellaCroce's mind. He was set to begin a fellowship in New Orleans in the fall. When Katrina struck, six feet of water settled inside the hospital where he was working. It changed his life.

John was married and had a three-month-old child. On his wife's wise insistence they packed the baby, a few provisions, their two boxers, and left town the day before Hurricane Katrina struck. They headed northwest to stay with his in-laws. When he returned, the house where they were living was full of mud and worms. "The first thing I saw shocked me. The 50 year old oak tree in the front yard had blown over," John says.

Two weeks later John still had not heard from anyone in the program.

John recalls the emotions he felt for the first few weeks and months after Katrina. "The thing I remember most before the hurricane is the time I spent working at Charity Hospital in New Orleans. It was destroyed by Katrina. As the days went by after the hurricane, I couldn't help but think about all the people I knew there. The news said many of the patients died from the flooding. I would think of a patient, and wonder if they might be one of the people who didn't make it. I think about one older man who rode an old bike everywhere. He had no money and waited until he was basically blind before he came to us. I replaced his cataract with a new lens and when he regained his vision he was so excited because he could ride to the store again. He felt like he had regained his independence. What happens to a guy like that when a hurricane hits? He's not going to ride his bike out of the city. Thoughts like these weighed heavy on my mind."

"I knew I had to carry on with my life. I was able to finish my senior residency at the VA and Charity Hospitals in central Louisiana. Then I applied to several programs for a fellowship. I felt best about the program at the Moran Eye Center at the University of Utah Hospital. I've only been here a few days, but we already love the people and the beautiful, clean environment."

Internship and Residency Programs

Moran Resident Dan Georgescu examines patient

INTERNSHIP PROGRAM

The internship program at the University of Utah Department of Ophthalmology and Visual Sciences is a transitional training program in conjunction with the Department of Internal Medicine. Interns rotate four months in ophthalmology and eight months in Internal Medicine rotating through Emergency, Internal Medical wards, Neurology and the VAMC.

RESIDENCY PROGRAM

Our residency is a three-year program (not including a transitional/preliminary year) and is approved and accredited by the American Council of Graduate Medical Education (ACGME). We appoint three residents each July 1 and begin accepting applications in early Spring.

The center's ophthalmology residents receive a tremendous amount of hands-on training and will perform approximately 300 cataract extractions and almost 400 other major surgical operations during their time in Utah. These numbers do not include assisting during surgery or performing parts of surgical cases with a faculty member. It is important to note that all surgeries are supervised by an attending faculty member.

Moran Resident Annie Kuo at her graduation from medical school.

My Own Path in Life

Annie Kuo says that when she was twelve, "a path was chosen for me to immigrate to America, from Taiwan. This path means experiencing what it was like to be functionally impaired. Since then I've strived to make my own path in life." And what a path that has been.

Annie became the first English speaker in her family, the first musician, the first female college graduate, and the first physician. When asked why she chose to become a doctor, Annie says, "The field of medicine satisfies my motivation to be an advocate for those in need."

Annie describes her vision of the doctor patient experience: "Ophthalmology provides another arena for me to contribute my musical talent in a purposeful way. My background in music as a classical pianist has been a great complement to my training as a physician. I parallel the doctor-patient relationship to the emotional connection between that of a performer and the audience. I constantly look for this special bond during my patient encounters, just as I value the moments when this connection is made during a performance."

"When I made my first trip back to my birthplace after ten years, I found out that a very close family friend became blind while I was gone. It was heart wrenching knowing that her last image of me would always be that little twelve-year-old girl who waved goodbye to her at the airport. She would never see what had become of me. Throughout my training, whether at a homeless shelter clinic in the South Side of Chicago, at a crowded hospital in rural Mexico, or during my surgery rotation, I met more patients plagued by their vision and the helplessness reflected on their faces that reminded me of my loved one. For these reasons, I am inspired to volunteer my time in under served population and third-world countries as an ophthalmologist in the future."

You don't need to be around Annie long before you begin to believe that, as she said, a path was chosen for her to immigrate to America.

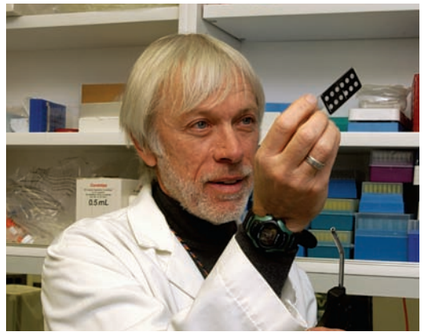
Research and Education at the Moran Eye Center

The research scientists of the Moran Eye Center are very active in training a new generation of biomedical scientists through their roles as members of the Interdepartmental Neuroscience Program and the Molecular Biology Program.

Many of our faculty serve as graduate program administrators, teach dozens of courses ranging from Visual Neuroscience to Developmental Biology, provide unique research training opportunities for post doctoral, medical, graduate and undergraduate students, and individually mentor Ph.D. candidates in their research laboratories. The Moran Eye Center stands out among ophthalmology research groups in its high level of graduate training expertise. These students are the engine that drives research progress everyday and are the very scientists who will take vision research to new heights. Without them, the discoveries and productivity of our laboratories would not happen.

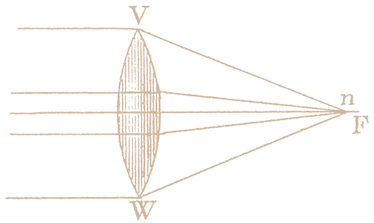
Many of our faculty members are also active in the University Research Program, which identifies promising young undergraduates and pairs them with research laboratories to "jump-start" their careers. One of our stars is Todd Michael Raleigh, who trained for several years in the Levine Laboratory and has now been accepted to the University of Utah School of Medicine. We eagerly anticipate his return to the Moran Eye Center as a medical student in research rotations.

Finally, our faculty members are also mentors to young Ph.D. students from around the world who come to the Moran Eye Center for advanced "post-doctoral" training. These are newly minted Ph.D.s who come to us for our experience and resources, bringing in return their fresh insights and cutting-edge talents. All of our faculty members are actively involved in training post-doctoral fellows and, in some cases, this training fosters such great productivity and independence that the faculty collectively vote to appoint them as Research Assistant Professors. This is a high-level educational process where these young faculty begin to compete with their mentors and peers in the open market of ideas, while retaining some shelter and mentoring in this intense endeavor. Drs. Kim Howes, Prakash Bhosale and Bryan W. Jones are examples of these young stars.



Robert Marc preparing retinal tissue arrays for analysis.

Dr. Robert Marc has long served in the Neuroscience Program. In 1993, when the program had but a dozen students, he redesigned the program's policies and procedures and the program now serves over 40 outstanding graduate students, many of whom are now studying in Moran Eye Center laboratories with Drs. Angelucci, Baehr, Fuhrmann, Levine, Marc, Normann and Zhang, as well as our Adjunct Faculty, Drs. Chien and Vetter. These students are then launched into new careers around the world.



Gilbert (seated) and Andrew Wong at piano competition.

Gilbert and Andrew practicing together at age eight.

From the Keyboard to the Surgeon's Table

Just as I find great joy in giving the gift of music to my listeners, I know that I will find gratification in helping patients with their vision as an ophthalmologist.

First year resident Gilbert Wong remembers an important moment that influenced his life and will make an impact on his career as an ophthalmologist: "My twin brother and I were in the final round of a national junior two-piano competition. The organizers had invited several hundred high school students from inner-city Miami to fill the auditorium. Most of these teens were probably accustomed to listening to Puff Daddy and Tupac, so I wondered if they were going to be able to sit through our 45-minute program of Rachmaninoff and Lutoslawski."

"Nonetheless, Andrew and I stepped onto the stage, sat down at our respective pianos, and began to play. The moment we started, a hush filled the auditorium and the listeners seemed captivated by our music. Our performance was nearly flawless, as if the audience had somehow sharpened our focus with their silent energy. At the conclusion of our final piece, the crowd stood up and burst out in cheers and applause. Backstage, I was greeted by a crowd of smiling teenagers waiting for autographs. Meanwhile, their teachers came up to me to express how much my brother and I had inspired their students. I felt wonderful, not only for winning a national junior championship with my brother, but also for touching the hearts of my audience. Just as I find great joy in giving the gift of music to my listeners, I know that I will find gratification in helping patients with their vision as an ophthalmologist.

Other music-related events in Gilbert's life have shaped his choice to become an ophthalmologist. "As a medical student, I organized and performed in recitals, music therapy sessions, and Christmas caroling in the hospital for patients and their families. It was gratifying to see the music brighten their day. Likewise, by maintaining, improving, and restoring sight, I can affect my future patients' lives in a very meaningful way."

A few years ago Gilbert saw a television program featuring Moran's Director of International Ophthalmology, Dr. Geoffrey Tabin, and Dr. Sanduk Ruit of Nepal as they carried out charitable missions in the Himalayan Region. "Inspired by what I saw, with my fluency in Chinese, I hope to do ophthalmology missions in China."

The physicians and staff at the Moran Eye Center feel confident that Dr. Wong will positively influence the hearing and sight of many people around the world throughout his lifetime.

Moran's Chief Residents

Rachel Horn

Dan Kline

Alan McInnis

Moran's Clinical Fellows

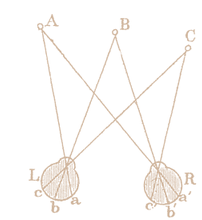
Robert "Wade" Crow

John DellaCroce

Huck Holz

Rishi Kumar

Darcy Wolsey



Moran's Research Fellows

Wellington Chang

Todd Johnson

Kandon Kamae

Moran's Residents

Bill Barlow

Karen Bourke

Dan Georgescu

Vincent Hau

Annie Kuo

Stacy Smith

Gilbert Wong

Albert Wu

Paul Yang

COMMUNITY OUTREACH

INTERNATIONAL OUTREACH

Ophthalmologists at the John A. Moran Eye Center have carried out medical missions and are contributing to international outreach programs all over the world, including Brazil, Bhutan, Cape Verde, China, Egypt, Ethiopia, Ghana, Guyana, India, Indonesia, Kenya, Kiribati, Korea, Latin America, Mali, Mexico, Morocco, Nepal, Peru, Russia, Rwanda, Samoa, Saudi Arabia, Sri Lanka, Sudan, Taiwan, Tanzania, Tibet, Tonga, Turkey, and Uganda.

LOCAL COMMUNITY OUTREACH

Ophthalmologists, opticians, nurses, technicians and staff at the John A. Moran Eye Center donate their services and are contributing to community outreach programs in the following Utah communities: American Fork, Blanding, Moab, Ogden, Orem, Provo, Salt Lake City, St. George, Tooele, and Vernal.

In addition to performing charitable services in programs located in these local cities, Moran Eye Center nurses, technicians and physicians perform more than 12,000 free vision screenings each year.

Patient Support Services

Julia reviewing magnifier options with patients.

Julia J. Kleinschmidt, Ph.D., L.C.S.W.
Director, Patient Support Program

EDUCATION:
University of Utah–Salt Lake City, UT
Masters of Social Work
Ph.D., Health Promotion and Education

RESEARCH FOCUS:
The Psychosocial Impact of Visual Impairment

ACADEMIC APPOINTMENTS:
Professor of Ophthalmology & Visual Sciences, University of Utah School of Medicine; Adjunct Professor Department of Health Promotion and Education; Faculty Associate, Department of Special Education.

Patient Support Services at the Moran Eye Center is a unique assistance program for our patients. We employ a qualified, caring in-house licensed rehabilitation and education counselor for our patients. Individuals with vision loss can lead full, productive lives. However, when first faced with the reality of the loss, life can seem overwhelming. This can be a trying and emotional time for the family as well.

SERVICES

In an effort to support patients and their families through this process, the Moran Eye Center offers a three-part Patient Support Program:

1. Orientation to Vision Loss: This is a 2-hour orientation held once a month for newly visually impaired individuals and their families. Topics include how to use remaining vision optimally, adjustment strategies, and resources available to help.

2. Supportive Counseling: For patients and/or their families, this is an opportunity to better understand and deal with the emotional response to the loss...and to encourage and support the adjustment process.

3. Support Groups: These group meetings are offered at no charge. They offer an opportunity to share experiences with others in the same situation and to give and receive encouragement and support. The groups include:

- VIP Group (For retired persons with visual impairment)
- Ataxia Support Group
- Pseudotumor Cerebri Support Group
- Graves' Disease Support Group
- Uveitis Support Group

A lantern from *The Barber of Seville* is passed around to audience members.

Moran Patient Support Groups at the Opera

Each year members of the Moran Patient Support Groups enjoy a night at the Opera. This year The Utah Opera Company presented a superb, colorful production of *The Barber of Seville*. Moran patients with various levels of vision loss experience a production with all of their senses, up close and personal.

This yearly event begins with an enthusiastic lecture about the opera by knowledgeable experts from Utah Opera Company management. During this discussion, props are brought out and passed around the audience so that attendees have the opportunity to touch and see them up close. Those with hearing loss are fitted with special headphones to enjoy the discussion and listen to the play when it is performed.

While sight and sound are the usual receptors at the opera, on this special night our patients and other community members are able to use additional senses, tactical experiences, and enhanced audio to take pleasure in the opera. The Moran Eye Center Patient Support Groups and the entire community thank the Utah Opera Center for this special and important opportunity.

The opera *The Barber of Seville* is set in the Spanish town of Seville in the late 18th Century. A young Spanish nobleman, Count Almaviva, is in love with beautiful Rosina, ward of the lecherous Doctor Bartolo, who plans his own marriage to her. Along comes the meddling Figaro, the town barber, and suddenly we have all the ingredients for confusion and mayhem...the question is, will there be a happy ending?

A VISION OF INTERNATIONAL EYE CARE

From left to right: Dr. Sanduk Ruit from Nepal; Dr. Randy Olson, CEO, Moran Eye Center; and Dr. Geoff Tabin, Director, Division of International Outreach, Moran Eye Center. Dr. Tabin and Dr. Ruit are co-founders of the Himalayan Cataract Project.

Dr. Geoff Tabin, Professor of Ophthalmology and Visual Sciences, and Director of the Division of International Ophthalmology at the Moran Eye Center, describes an experience from one of his charitable missions to Pakistan. "At first the Pakistanis told us that we couldn't perform cataract surgeries because they didn't want us to put 'Christian Eyes' in their people. Wanting to be respectful of their deeply held beliefs, we purchased 200 Korans and ensured the leaders that when the patient's sight was restored, the first thing they would see was the Koran. They agreed to allow us to proceed." Such are the experiences of international ophthalmology outreach.

Dr. Tabin is co-founder with Dr. Sanduk Ruit of the Tilganga Eye Center in Katmandu, Nepal. Since their first surgery in 1994, more than 100,000 individuals have received the gift of sight through intraocular implants at the Tilganga Eye Center and its satellite locations.

Individuals in undeveloped countries, especially in such high altitude regions as the Himalayan region, often develop blinding cataracts as a result of exposure to intense ultra violet light at high altitude. Before surgery and modern medical care was made available, when these individuals lost their sight it was common for them to be shunned as non-productive members of society. Left to fend for themselves, they commonly died an early and tragic death as a result of starvation, disease and accidents. To people in these regions, the miracle of modern cataract surgery means not only a restoration of sight, but also the gift of life.

The Moran Eye Center feels strongly that eye care services in developing countries will last and prosper in direct proportion to the amount of training ophthalmologists within the local communities receive. With this goal in mind, a plan is underway to allow University of Utah Ophthalmology students, residents and fellows to spend three months in Nepal, while a reciprocal program will bring doctors from the Himalayan region to train at the University of Utah.

A Trip to Africa

For a week in April this year, Dr. Alan Crandall, Dr. Robert Hoffman, and Dr. Geoffrey Tabin performed hundreds of surgical cases in Ghana and other parts of Africa. This mission to Africa is just one representation of the many charitable missions carried out by the Moran Eye Center Physicians to more than 30 countries.

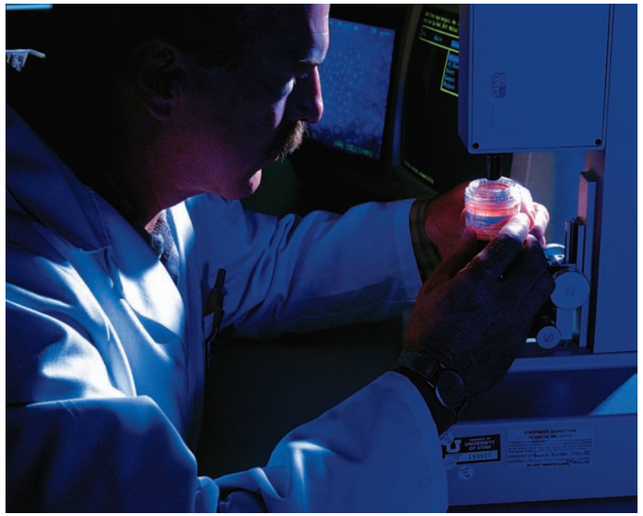
Drs. Crandall, Hoffman, and Tabin with Moran volunteers and healthcare staff in Ghana.

Drs. Tabin and Crandall with happy cataract recipient in Africa.

Dr. Jason Goldsmith on another African charitable mission.

For the eighth year in a row, ophthalmic specialists from the John A. Moran Eye Center have carried out medical missions to West Africa. For a week in April this year, Dr. Alan Crandall, Dr. Robert Hoffman, and Dr. Geoffrey Tabin performed hundreds of surgical cases in Ghana and other parts of Africa. They also taught physicians and other health care workers in this area how to perform many of these procedures. Dr. Crandall is Director of Glaucoma and Cataract services at the Moran Eye Center. Dr. Hoffman is Chief of the Division of Pediatric Ophthalmology and Eye Muscle Disorders. Dr. Tabin is the Director of the Division of International Ophthalmology. This mission to Africa is just one representation of the many charitable missions carried out by Moran Eye Center physicians to more than 30 countries. In the past year alone, Dr. Tabin has worked in Ghana, Nepal, China, Tibet, and Bhutan.

A Lasting Gift of Sight



Human corneas are prepared for sight-restoring surgery.

Mark D. Mifflin M.D.
Medical Director, Utah Lions Eye Bank

MEDICAL SCHOOL:
M.D., University of Nevada School of Medicine–Reno, NV

RESIDENCY:
University of Utah–Salt Lake City, UT

FELLOWSHIP:
University of Utah–Salt Lake City, UT
Casebeer Eye Center–Scottsdale, AZ

ACADEMIC APPOINTMENTS:
Associate Professor of Ophthalmology & Visual Sciences–University of Utah School of Medicine; Residency Program Director and Education Director for the Department of Ophthalmology

Over 40,000 Americans and hundreds of thousands of others around the world endure corneal blindness each year. Vision loss from corneal disease may be the result of congenital corneal disease, infection, trauma, chemical burns or corneal swelling. Fortunately, through the modern procedure of corneal transplantation, sight restoration is possible.

Located in the John A. Moran Eye Center, the Utah Lions Eye Bank serves the state of Utah and the Intermountain West. Every year the Eye Bank facilitates the donation of hundreds of corneas for transplant as well as other ocular tissues for training and research purposes. The majority of corneas and tissues that are recovered by the Utah Lions Eye Bank go to surgeons throughout Utah, but some travel long distances to help fill the need for sight restoring surgeries around the globe.

The Utah Lions Foundation helped establish, and continues to support, the Eye Bank. The relationship between the Utah Lions Eye Bank and the John A. Moran Eye Center is one of great respect and is mutually beneficial. In addition to providing eye tissue for research, the Utah Lions Eye Bank supports a cornea fellow at the Moran Eye Center and employs pathology fellows.

The Staff of the Utah Lions Eye Bank at the Celebration of Life Monument located in the heart of Salt Lake City.

"To me, eyesight is the most precious of all the senses with which mankind is blessed. The Eye Center at the University of Utah started as a small step in the direction of trying to protect the eyesight of those who have it, and God willing, to restore the vision of those who have lost it. Today, through the tireless work and faith of some very dedicated and talented people, the Center has emerged as a world-class research facility capable of realizing the core dream of sight to the sightless."

John A. Moran