

Viewpoint



FROM THE EDWARD S. HARKNESS EYE INSTITUTE

& THE DEPARTMENT OF OPHTHALMOLOGY, COLUMBIA UNIVERSITY

SPRING 1997

THE EXCIMER LASER



The VISX System Excimer Laser: developed by Dr. Stephen Trokel, to correct patients' vision without glasses, lenses, or invasive surgery.

capable of etching fibers as fine as a single strand of human hair, they could also make minute alterations to change the eye's angle of refraction. Dr. Trokel's reflections on the usefulness of the laser in reshaping the cornea turned out to be correct and ultimately led to his development of an entirely new approach to vision correction.

The process that took place between his initial curiosity and the eventual dramatic results he achieved is described by Dr. Trokel as a "crystallization" of successive investigative inquiries. "I started by talking to military scientists because of their experience with lasers and, then, with the help of Dr. Marc

RESHAPING OUR EYES

When physicist-turned-ophthalmologist Dr. Stephen Trokel considered the delicacy required by eye surgery, his thoughts turned to the laser and its ability to cut with exquisite precision. "I was intrigued by the possibility that, using spark-induced shock waves, lasers might be substituted for the blade of a surgical knife to slice through the membranes of the eye," says Dr. Trokel, Columbia University Professor of Clinical Ophthalmology. He speculated that if lasers were

IN THIS ISSUE

New miracles in
laser eye surgery

Battling
glaucoma

Philanthropic
insight

continued page 5

**VIEWS FROM
THE CHAIR**

June, 1997

Dear Friends, Patients, Colleagues, and Alumni:

It is a great pleasure to bring you the 1997 spring/summer edition of Viewpoint--our second in this new venture--highlighting some of our most recent accomplishments at the Edward S. Harkness Eye Institute. Drs. Stephen Trokel and Marc Odrich, developers of excimer laser surgery for the correction of refractive disorders, have opened the Columbia Vision Correction Center at Columbia-Presbyterian Eastside, where they evaluate and treat patients with nearsightedness and astigmatism and undertake basic and clinical research on refractive disorders.

Drs. Max Forbes and Conrad Gilliam are coordinating an international effort, as part of a major Columbia University initiative, to identify the genes which cause open angle glaucoma. Major new technological advances in use at the Eye Institute are already helping to assure early diagnosis and timely treatment of this prevalent disease. In addition, renovation of operating rooms at the Institute, complete with state-of-the-art equipment for carrying out delicate microsurgical operations, will be completed this summer.

Excellence and Innovation. These are the goals toward which the Institute's faculty strives, even during difficult times of reduced funding for academic medicine. The partnerships with our patients and friends that have helped us to achieve our objectives hold a place of great significance in our success. We are very grateful to all of you whose thoughtfulness and generosity continue to support research efforts and clinical programs at the Eye Institute. I do hope that others reading this newsletter will also want to support the development and implementation of clinical research, thereby improving our knowledge and treatment of blinding diseases.

We welcome any questions you might have and are available to provide you with additional information regarding any eye diseases. Please don't hesitate to contact Senior Development Officer Susan Taylor at 212.304.7200, who will coordinate your requests.

Thank you again for your interest in the work of the Harkness Eye Institute.

Sincerely,

A handwritten signature in blue ink that reads "Stanley Chang".

*Stanley Chang, M.D.
Edward S. Harkness Professor and
Chairman of the Department of Ophthalmology*

VISIONARY GIVING

Helen Friedman was afraid she would never play tennis again. After two unsuccessful surgeries to repair a detached retina, she consulted surgeon Dr. Stanley Chang, Columbia's Edward S. Harkness



Helen and Sid Friedman

Professor of Ophthalmology and Department Chair.

"He's phenomenal," says Mrs. Friedman. "He promised I would be able to travel, collect art and antiques--even play tennis. He was right. He saved my life." She and her husband, Sid, wanted to show their

"tremendous gratitude" for Dr. Chang.

After talking to Columbia's planned giving specialists, they decided to

make a gift through the Gouverneur Morris Pooled Income Fund. Their gift not only supports Dr. Chang's work, but also provides lifetime income for Mrs. Friedman and offers immediate income tax benefits.

A PLAN FOR GIVING... AND RECEIVING

The joy of philanthropy is doubled through planned giving. Both the recipient and the donor of the gift enjoy benefits from the investment made through pooled income funds like the one the Friedmans chose. This is how planned giving can work for you.

When you contribute to a Columbia Pooled Income Fund, you are assigned shares in that fund. You and/or your designated beneficiary receive quarterly payments for life based on your *pro rata* share of the Fund's net income and an immediate income tax charitable deduction. By contributing appreciated securities, you will also avoid capital gains tax.

You may choose from: The Gouverneur Morris Fund, invested primarily for income, or The Seth Low Fund, invested for both income and capital appreciation. The minimum initial gift to either fund is \$5,000. Additional gifts of \$1,000 or more may be made at any time. Of course, your contribution may be made to benefit the Department of Ophthalmology.

For more information, or to discuss the giving option best for you, please call: Elia Desruisseaux, Esq., Director of Planned Giving, toll free at 888-277-9375.

ULRICH OLLENDORFF, M.D., VISITING LECTURESHIP ESTABLISHED AT HARKNESS

Steve Ollendorff wanted to do something special for his father, Dr. Ulrich Ollendorff. A German refugee, Dr. Ollendorff came to the United States in 1939 and eventually established an ophthalmology practice that became a Washington Heights institution. Last fall, as a tribute to Dr. Ollendorff, Steve and his wife, Bjorg, made a generous gift through the Ollendorff Family Philanthropic Fund of the Center for Christian-Jewish Understanding of Sacred Heart University, to endow the Annual Ulrich Ollendorff, M.D., Visiting Lectureship at the Harkness Eye Institute.

Born in Breslau in 1906, Ullrich Ollendorff graduated from medical school at the top of his class, and was a professor of Ophthalmology in Breslau until the Nazi regime forced him to leave academia. With his wife, Anne, and their young son, Stephen, Ullrich succeeded in escaping from Germany to the United States and, after passing his medical boards, began to practice ophthalmology in Washington Heights. During his 46 years in practice, Dr. Ollendorff developed one of the largest followings in the city; when he retired in



Dr. Ulrich Ollendorff

1986 at the age of 80, his patient base numbered more than 300,000 people.

"Everyone in Washington Heights knew him," says Mr. Ollendorff, a New York City attorney, of his father. At the time no Jewish doctors practiced at Columbia-Presbyterian, so Ulrich was

granted admitting privileges at St. Elizabeth's Hospital and at Wadsworth Hospital, where he performed eye surgeries several times a week. A "simple" man, Ulrich Ollendorff would accept an apple pie in lieu of his fee and sometimes climbed several flights of steps to make house calls--at \$6.00 per visit!

"My father generated enormous respect within his community," says Steve Ollendorff. "The Ulrich Ollendorff, M.D., Visiting Lectureship will not only benefit students and practitioners, but will also stand as a well-deserved tribute to a man who devoted his life to promoting excellence in ophthalmologic care."

The first annual Ulrich Ollendorff, M.D., Visiting Lectureship will be presented at the Eye Institute this fall. ☪

Excimer Laser cont.

Odrich, Columbia University Assistant Professor of Clinical Ophthalmology, did some early laboratory experiments. We continued our studies at IBM, where excimer lasers were being used to shape computer chips, went on to consult with physicist John Marshall at the Institute of Ophthalmology in London, and, finally, built the first prototype laser in 1986." Last year, after completing clinical trials at vari-

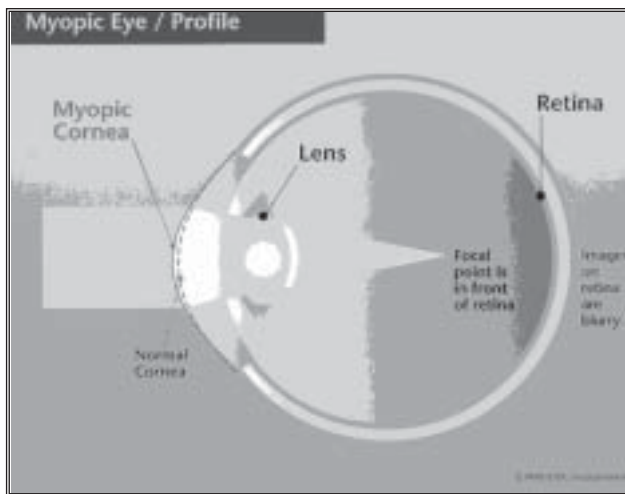
Dr. Marc Odrich, (1) performs surgery on a cornea, like the one in the diagram below (2), with a contour too steep for entering light to reach the retina's focal point. The VISX System will reshape the corneal surface (3) with meticulous strokes to correct the focal angle.



1

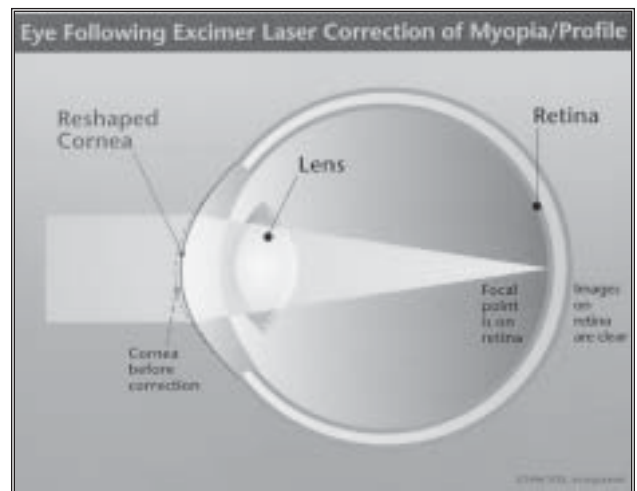
S C U L P T I N G V I S I O N

The VISX Laser, located in the Ophthalmology Suite at Columbia - Presbyterian Eastside (60th Street between Madison and Fifth Avenues), is the only vision correction system that is FDA-approved for the treatment of astigmatism as well as for nearsightedness. About 60 million Americans are myopic or nearsighted--a condition in which the eyeball is elongated and/or the curvature of the cornea is too steep. As a result, light does not enter the eye correctly, and images, falling short of the retina, appear blurry from a distance. Since the late 1970s, doc-



2

ous sites throughout the United States, the VISX Excimer Laser System, which Dr. Trokel and his colleagues developed, received FDA approval for use in the correction of mild to moderate nearsightedness (-1.0 to -6.0 diopters). The VISX Excimer Laser System has also recently received approval to correct astigmatism.



3

tors had been correcting this condition with radial keratotomy (RK), using a scalpel to cut spokelike slits in the cornea and, thereby, flatten its contour. Dr. Trokel's new technique, called photorefractive keratectomy (PRK), has replaced the scalpel with an ultraviolet beam, insuring far greater safety and accuracy than conventional RK surgery. PRK is also available to help the approximately three-quarters of all Americans who have some degree of astigmatism, one more condition caused by an irregular corneal curvature that affects visual acuity.

Laser vision correction for myopia and astigmatism is an outpatient procedure that uses the cool ultraviolet light of the excimer laser to alter the curvature of the cornea. Prior to treatment, the laser system's computer precisely calculates the exact amount and shape of corneal tissue to be removed--usually less than the thickness of a strand of human hair. The patient is placed in a reclining chair, the eye is numbed with anesthetic drops, and the eyelids are held open gently by a retainer placed between them

during treatment. Microscopic amounts of corneal tissue are removed from the eye as it is exposed to an ultraviolet beam for less than 60 seconds; the entire procedure is typically completed in about 15 minutes.

“The real voyage of discovery consists not in seeking new landscapes but in having new eyes.”

Marcel Proust

Treatment is painless, though patients may experience some mild discomfort for up to three days following surgery. During clinical studies, 94% of PRK patients achieved corrected vision results of 20/40 or better--sufficient vision to obtain a driver's license without restriction in most states.

Those patients who choose PRK are delighted to be free from the discomfort and responsibility of corrective lenses. “Law school did me in,” says Gretchen Walsh, a 34-year-old mom, who is typical of Dr. Odrich's laser patients. “By the time I completed my studies, my eyes were shot.” Feeling miserable in contact lenses, this spring she underwent PRK on her left eye, in which she now has perfect vision. Ms. Walsh is planning to have the same surgery on her other eye this summer.

"Within the next few years, PRK will become a standard means of vision correction," predicts Dr. Odrich, who also expects to use the laser to treat hyperopia or farsightedness. He and Dr. Trokel head the Columbia Vision Correction Center, a new division of the Department of Ophthalmology at Columbia that is devoted to the study and correction of refractive disorders. "Our goal," says Dr. Odrich, "is to bring together outstanding interdisciplinary teams, including basic researchers, optometrists, and ophthalmologists to integrate their areas of expertise."

B E Y O N D R E F R A C T I O N

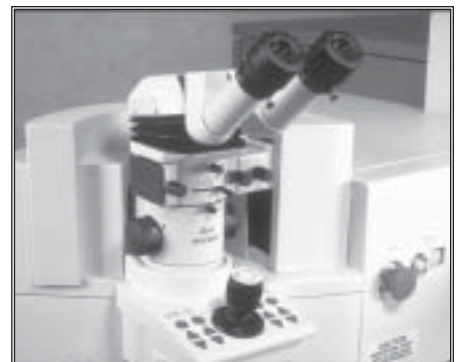
While some doctors and patients may question the need for a surgical procedure to treat common vision problems that can be corrected with eyeglasses or contact lenses, there is little debate over the use of phototherapeutic keratotomy (PTK) to treat patients with various forms of corneal disease. "Their stories are very compelling," says Dr. George Florakis, who is Assistant Professor of Clinical Ophthalmology and a cornea specialist at the Harkness Eye Institute. PTK is used to treat patients with corneal scarring, recurrent erosion syndrome, a breakdown of surface tissue that causes redness and pain, or corneal dystrophy, a rare inherited condition that leaves patients with excess corneal tissue deposits and severe bouts of

pain. "These disorders ruin lives and relationships," says Dr. Florakis, who has seen entire families plagued by corneal disease. "For many of these patients, PTK offers relief that is otherwise unavailable."

" L I K E - N E W " E Y E S

According to Dr. Trokel, although complications are rare--about one per thousand procedures--he adds, "this is surgery, and it may not be for everyone." In fact, PRK is not recommended for patients with autoimmune or immunodeficiency diseases, those who are diabetic, or those with severe allergies, or a number of other precluding conditions. But, PRK has significantly improved the "quality of life" for many of his grateful patients. Just ask the competitive water-skier who couldn't see the boat that was pulling her, the retired businessman-turned-sailor who need no longer struggle with glasses that fog in the mist, or the new mother who swims every day and must keep a clear and vigilant eye on her nearby child--all are delighted by their "like-new" eyes. ⊕

The VISX System control panel that guides the painstaking precision of the laser through sensitive corneal surgery



"If I had been screened just one time,"

says Kirby Puckett, former baseball player and popular 10-time all-star outfielder for the Minnesota Twins, "I'd be playing baseball



right now." A year ago last March, just as spring training was about to begin, the 35-year-old Puckett woke one morning with badly blurred vision in his right eye. When he saw a black spot in front of his eyes, Puckett was worried, but he was also optimistic and thought it would go away.

Unfortunately, it didn't. Several surgical attempts to restore Puckett's vision have failed and, even though he is still active as the Twins', executive vice president, he

will never play ball again. As a result of his career-shattering loss, Kirby Puckett has become an outspoken advocate for "Don't Be Blindsided!," a program to encourage glaucoma screening.

A RRESTING THE

" SNEAK THIEF OF SIGHT"

Glaucoma is called "the sneak thief of sight" because of the insidious nature with which it strikes. Like Kirby Puckett, nearly 120,000 Americans lose all or part of their vision to glaucoma each year, while another 900,000 experience some form of gradual vision damage from the disease. Glaucoma is the leading cause of preventable blindness in the United States and has been diagnosed in more than two mil-

lion Americans. It is also likely that an additional two million people have the disease but are ignorant of their plight. In fact, nearly half of all people with glaucoma do not know they have the disease, and even the most medically-savvy of them are often caught unaware of its furtive presence. This point was illustrated at a recent meeting of the American Medical Association and the National Medical

Association, where physicians and their families were offered glaucoma screening examinations. More than 10% of these informed people were surprised to find that they showed signs of glaucoma and should see an ophthalmologist for further evaluation and treatment.

Since controlling glaucoma as soon as possible is the only way to prevent vision impairment, early detection is the real key to curbing this widespread disease. Dr. Max Forbes, Professor of Clinical Ophthalmology at Columbia University and Director of the Glaucoma Service at Harkness, explains the two critical determinations doctors must

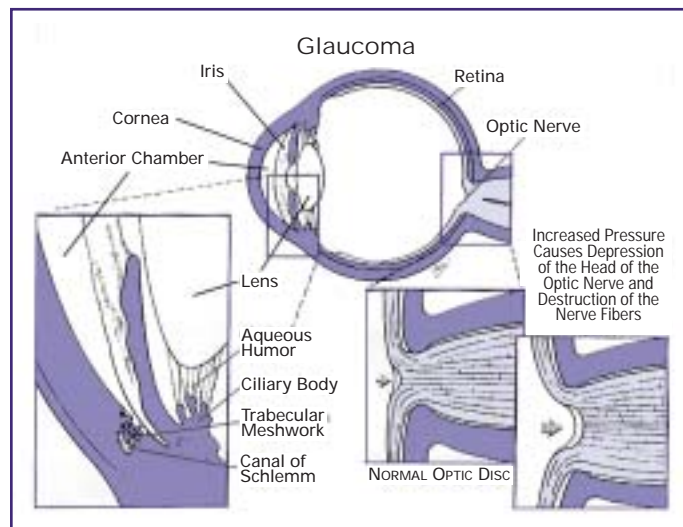
make. "We need to know whether the optic nerve is damaged and, if so, whether or not the damage is progressing. The good news is that new technologies are making it possible to quantify and evaluate changes in the optic nerve. This means that we can obtain the precise diagnostic information we need to tell us if and when glaucoma treatment should begin. If a

patient is already receiving treatment, the new technology helps us to evaluate how effective it has been in curtailing further damage from the disease."

IN THE VANGUARD OF EARLY DETECTION

The Department of Ophthalmology at Columbia is in the vanguard of glaucoma diagnostics thanks to its recently ac-

quired Confocal Scanning Laser, one of the most advanced measuring systems available for identifying and evaluating glaucoma. The new procedure, called "optic disc topography," uses a scanning laser to measure the depth of tissue in the eye's "optic disc cup."



The intraocular pressure that causes glaucoma can be monitored by checking changes in the optic nerve layer, seen on the right above. Pressure can be relieved by surgery that allows aqueous humor to drain through the trabecular network of the eye, shown on the left.

Page 805 Taber's Cyclopedic Medical Dictionary 17th Edition

This area expands as increased intraocular pressure causes its nerve fibers to atrophy. Optic disc topography--accomplished in seconds without dilating the patient's pupil--provides a precise reading that shows the exact depth of some 65,000 optic disc points--similar to the dots that comprise a television screen image. When compared to previously taken scans, these



Looking for signs of glaucoma, Dr. Max Forbes measures the depth of a patient's optic cup with the Eye Institute's new Confocal Scanning Laser, and receives an image displaying clusters of dots locating the thickness of the nerve fiber layer in various part of the eye.



readings can show changes in the optic nerve layer that indicate whether further tissue erosion--leading to vision loss--is occurring.

Another advanced imaging system, the "Nerve Fiber Analyzer," will also soon be available to doctors and patients at Harkness. Complementing the Scanning Laser Ophthalmoscope, the Nerve Fiber Analyzer--generously funded by Mr. Homer Rees (see "Diary of a Donor")--quantifiably measures the thickness of the nerve fiber layer emanating from the optic nerve. Since a thinning nerve fiber layer indicates the presence of glaucoma, this measurement provides the critical information needed to determine when vision-saving treatment should begin.

"The importance of having highly refined diagnostic capability cannot be overstated," says Dr. Forbes. As an example, he points to a 32-year old patient who thinks she may have inherited glaucoma. "She, herself, has slightly elevated pressure and also suspects that her mother may have early-stage glaucoma. Although her optic nerve is somewhat cupped, her visual field test, in which the patient is asked to respond to peripheral visual stimuli, is normal. The Nerve Fiber Analyzer will tell us whether the patient's optic nerve fiber layer has thinned. She

may require immediate therapeutic intervention--or, she may be able to successfully delay treatment for many years."

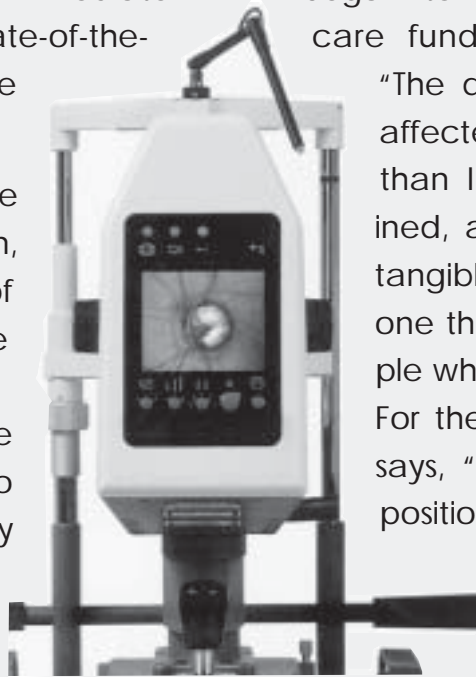
Eye Institute patients who are already being treated for glaucoma, or may suspect they have this condition, can look forward to receiving even more exacting diagnoses and carefully controlled care for glaucoma with the installation of the new Nerve Fiber Analyzer. ☪

Supporting the Management of Glaucoma

D I A R Y O F A D O N O R

"Over my lifetime, I haven't had a lot wrong with me," says Homer Rees, one of Dr. Max Forbes's patients. Mr. Rees, who now suffers from glaucoma, recently filled one of the Eye Institute's most immediate needs with the funds to buy state-of-the-art technology called the Nerve Fiber Analyzer.

Former chairman of the Prudential Capital Corporation, Mr. Rees first became aware of his glaucoma in 1978 at the age of 48. Although relatively stable for a long time, in the last five years, his eyesight has begun to decline noticeably. "I really value the care I am receiving at the Eye Institute, where Dr. John Espy referred me to Dr. Forbes. Dr. Forbes and his colleagues are never too busy to follow through on treatments. I had always heard that glaucoma resulted from elevated intraocular pressure, but have discovered that sometimes people with normal pressure can also develop this destructive disease. There is so much we still need to learn about the causes of glaucoma and there is a great need to improve therapeutic remedies."



Technology like the Nerve Fiber Analyzer, a gift from Eye Institute patient Homer Rees, is essential to early detection and monitoring of glaucoma, the key to maintaining sight in spite of the disease.

Concerned about cutbacks in government support and the impact of managed care on medical research, education, and treatment programs, Mr. Rees began to worry about where eye care funding would come from.

"The deterioration of my vision affected me more profoundly than I could have ever imagined, and I wanted to make a tangible gift to the Eye Institute, one that would help other people who were in the same boat. For the first time in my life," he says, "I felt I was in a financial position to make a substantial gift. The stock market had taken off, and I knew that by giving appreciated securities I could help the Eye Institute. It was even possible for me to realize a significant tax benefit at the same time."

The Eye Institute owes a great deal to Mr. Rees's thoughtful generosity. His gift will help many, many people whose glaucoma requires the added advantage of extremely precise monitoring provided by the Nerve Fiber Analyzer.



Treating Glaucoma

Although vision loss from glaucoma is irreversible, once accurately diagnosed, the disease can be treated to prevent further damage to the optic nerve. Treatment options available to patients may include:

EYEDROPS to control intraocular pressure (IOP). While most drops must be applied several times a day and often have side effects, a newly available successful treatment, latanoprost (Xalatan), developed by Columbia's Dr. Laszlo Z. Bitó, needs to be taken only once a day and is generally well tolerated by patients.

PILLS to improve IOP control are sometimes prescribed in addition to eyedrops. Taken from two to four times a day, pills act by reducing fluid within the eye.

LASER SURGERY, called trabeculoplasty, a painless procedure lasting 10-20 minutes, is performed in the doctor's office or at an outpatient facility. Heat from the laser shrinks part of the eye's drain, forcing adjacent areas to stretch open further, so that fluid is discharged more freely. Nearly 80% of patients respond well enough to this laser treatment to avoid or delay traditional surgery, and some patients are eventually able to discontinue some of their medication.

TRADITIONAL SURGERY, commonly the trabeculectomy, involves removing a small section of the trabecular meshwork to provide an opening through which more fluid in the eye (aqueous humor) can drain, and thereby reduce pressure in the eye. The surgery is performed on an out-patient basis with local anesthesia. Most patients are able to discontinue medication after surgery; about 10-15% require additional surgical treatment.

WHO IS AT RISK?

People who are susceptible to glaucoma may:

have

- myopia
- a family history of glaucoma
- diabetes

be

- over 45
- of African-American or Asian-American descent

have had

- a long exposure to cortisone products
- a previous eye injury.

**BUT, REMEMBER--
glaucoma affects
people of all ages and
all races!**

Investigating the Genetics of Glaucoma

A WORLDWIDE DASH TO DECODE DNA

Glaucoma runs rampant in Anna M.'s family. A retired schoolteacher living in upstate New York, she first became aware of her own condition in the fall of 1982--shortly after her 50th birthday. Within her large Italian family, seven siblings have been diagnosed with various stages of the disease. Among her three children, ten nieces, and eight nephews, it is very likely that several will eventually be stricken.

Glaucoma is recognized as a strongly genetic disease, though little is known about underlying causes that trigger the disease. When the eye's trabecular meshwork, the sponge-like tissue that serves as the eye's "drain", ceases to work, fluid backs up, increasing intraocular pressure and, finally, causes severe damage to the optic nerve. While not all glaucoma patients would appear to have inherited the disease, a significant percentage of them know of other family members who are similarly affected. According to Columbia University's Dr. Peter Libre, a glaucoma specialist, "Genetic research holds the

key to identifying those patients most vulnerable to the disease and to the promise of timely preventive treatment. If we can identify the genes implicated in primary open-angle glaucoma (POAG), the disease type that affects 80% of patients, we can learn about its basic causes and develop interventions to stop nerve damage before it ever begins."

A CRITICAL QUESTION

What genetic causes predispose certain individuals to glaucoma? This is one of the critical questions that Dr. T. Conrad Gilliam, Columbia University Professor of Genetics and Devel-

opment, and researchers in his lab may soon be able to answer. As part of the Columbia Genome Project, they have built and fully implemented a genotyping laboratory where they have begun to collect blood samples from glaucoma patients and their first-degree relatives who have POAG. A world-renowned genetics expert, Dr. Gilliam has led other investigations that succeeded in discovering genes for inherited disorders, including spinal muscular atrophies, Parkinsonism-dystonia, retinitis pigmentosa, and Wilson's disease.

Scientists believe that mutations found in a number of genes scattered throughout the human genome are responsible for rendering an individual susceptible to POAG and other forms of glaucoma. Earlier this year, University of Iowa researchers located the gene linked to juvenile glaucoma, a subset of primary open-angle glaucoma that may account for an estimated 100,000 cases in the United States. By cloning the gene, known as GLC1A, investigators hope to learn about its function and the specific biochemical mechanism that causes this form of glaucoma.

AN INTERNATIONAL SEARCH

Recently, Columbia's Department of Ophthalmology engaged a genetics coordinator, Michele Pallai, to assist Drs. Forbes and Gilliam. They have also assembled a team of specialists: Drs.

Rajendra Bansal, Peter Libre, Steven Odrich and Robert Schumer, who will help to identify and locate family members of glaucoma patients. Ms. Pallai's

"Our team is very strong and we are making amazing progress in our search."

work involves mapping out family trees, contacting relatives, and arranging for the collection of blood samples that are sent to Columbia labs for analysis. Collaborations with other geneticists, including those at Mt. Sinai and Cornell, will help to enlarge the pool of patients from which DNA samples can be drawn by researchers. Dr. Forbes and other investigators will travel to areas around the world where there is a high incidence of glaucoma to collect and study blood

samples from those who are afflicted. "Our team is very strong and we are making amazing progress in our search," says Dr. Forbes. "Once we identify the genetic mutation that causes a certain type of glaucoma, we can screen patient populations at risk for the disease. This is an exciting approach, one that we couldn't have imagined possible just a short time ago."

Through the efforts of Dr. Cynthia MacKay, Associate Professor of Clinical Ophthalmology, Eye Institute research on the genetic causes of glaucoma is being supported by a \$1.5 million grant from the Partridge Foundation. A development stage biochemical genetics company, VIMRx Pharmaceuticals, is providing additional funding as part of a \$30 million licensing agreement with the Genome Center at Columbia University. ⊕

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Our thanks to the following donors who have provided generous support for Harkness Eye Institute programs during the period July 1995 to April 1997:

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