FOCUS: VEI's 2020 Vision
Regional and International Outreach · Patents Pending · Pediatric Eye Care

PROFILE: Brad Kehler, O.D. · NEWS: “Gass Atlas” Updated
Dear Friends,

Over the past decade, Vanderbilt University Medical Center has experienced unprecedented growth: new hospital and research facilities, dramatic increases in research funding, hundreds of new faculty members, and greater clinical volumes both for outpatient and hospital care. We have been dramatically successful at becoming bigger. However, as we move towards the second decade of the 21st century, our mission is shifting towards becoming better. In fact, the new strategic plan for the Medical Center focuses on creating a measurable impact on health by working in new ways, producing results that matter and transferring those successes to society.

Here at the Vanderbilt Eye Institute, our mission is clearly in step with our Medical Center. While we also have experienced unprecedented growth in facilities, faculty, clinical volume, and research grants, we are committed to making a difference in addressing the challenges of vision loss. This goes well beyond contemporary cataract, bladeless refractive laser for myopia, or intracocular injections of antiangiogenic agents for wet macular degeneration. Greater impacts can be achieved through our novel preventive care programs, such as screening for diabetic eye disease and amblyopia.

The Vanderbilt Ophthalmic Imaging Center (VOIC) has instituted diabetic retinopathy mobile screening in several underserved areas, including urban Nashville, the upper Cumberland region of Tennessee and Peru. The VOIC facilitates capturing retinal images from diabetic patients, which are sent electronically to the VOIC reading center, where “at risk” eyes are identified and referred to specialists in the care of diabetic eye disease. Similarly, our pediatric ophthalmologists have worked in collaboration with the Lions Clubs of Tennessee to screen pre-kindergarten children for lazy eyes, or amblyopia. Volunteers originally used a sophisticated camera to take pictures of the eyes; when interpreted at Vanderbilt, children with abnormalities would be referred for evaluation and treatment. Now the cameras have been replaced by a digital system, which is less expensive because there is no longer the cost for film, and is equivalent in accuracy. Each year, we screen over 30,000 children in Tennessee. More significantly, the program has spread to other states and other countries, so that approximately one million children have been screened using the Vanderbilt-Lions model.

The Medical Center has named their new strategic plan Vision 2020. For those of us at the Vanderbilt Eye Institute, we live Vision 2020 every day!

Sincerely yours,

Paul Sternberg, Jr., M.D.
G. W. Hale Professor and Chair
Vanderbilt Eye Institute

EDITOR’S NOTES

Vanderbilt Vision is a publication of Vanderbilt Eye Institute, a department of Vanderbilt University Medical Center. Vanderbilt Vision provides ophthalmologists with information on current research and state-of-the-art clinical applications.

CHAIR, VANDERBILT EYE INSTITUTE
Paul Sternberg, Jr., M.D.

EDITORIAL BOARD
Paul Sternberg, Jr.
John Penn
David Calkins
Louise Mawn
Sarah Reynolds
Anne Enright Shepherd
Joel Lee
Meredithe Carr

Vanderbilt University Medical Center is a comprehensive research center committed to excellence in patient care and physician education.

Vanderbilt Vision is written for physicians and friends of the VEI and does not provide a complete overview of the topics covered. It should not replace the independent judgment of a physician about the appropriateness or risk of a procedure for a given patient.

PLEASE DIRECT ANY CORRESPONDENCE TO:
John S. Penn, Ph.D.
Vice Chairman
Vanderbilt Eye Institute
1215 21st Avenue South
8000 Medical Center East
Nashville, TN 37232-8808

Release date: November 5, 2008
Vanderbilt University Medical Center

TABLE OF contents

2 FOCUS
VEI’s 20/20 Vision

6 Vanderbilt Ophthalmic Imaging Center

8 PROFILE
Brad Kehler, O.D.

10 Patents Pending

14 Pediatric Eye Care

15 NEWS
“Gass Atlas” Updated

16 ELECTIONS, AWARDS & GRANTS, EVENTS

Cover: The Future is Now, Vanderbilt Eye Institute’s 2020 Vision. Artwork: Getty Images and Tony Richardson.
The goal of Vanderbilt Medical Center over the past decade has been to become one of the best medical centers in the country – by solidifying its financial base, improving and documenting its quality, building its infrastructure and physical plant, and attracting the best clinicians, students, researchers and faculty. In its recently published strategic plan for the next decade – Vision 2020 – the Medical Center outlines its objectives for the decade leading up to the year 2020.

The plan’s focus is outward: harnessing Vanderbilt’s assets to create measurable and obvious impact on the health of our society. This impact will be accomplished by:

- working in new ways
- producing results that matter, and
- transferring its successes to society.

The Vanderbilt Eye Institute is ahead of the curve in planning for 2020. For the last five years, our efforts have focused on addressing the most critical health issue facing ophthalmologists today – preventing blindness in light of an aging population and an increase in diabetes and other chronic diseases that affect vision. We are doing this by focusing on three leading causes of vision loss – diabetic retinopathy, age-related macular degeneration, and glaucoma – and three key areas of study: oxidative damage and aging, vascular biology and hemodynamics, and neuroprotection.

That’s the “what” . . . but what about the “how”? The following examples clearly demonstrate how the Vanderbilt Eye Institute is supporting the Vision 2020 philosophy in everything we do. (continued)
"We possess at this university a wealth of intellect – extraordinary bandwidth that when fully engaged can have great power and potential."

(From Vision 2020)

**Working in New Ways**

Currently, several VEI faculty members have patents pending that will revolutionize the way eye care is delivered in the next decade (see article, page 10). Most of these inventions could never have been possible without collaboration with Vanderbilt's brilliant biomedical engineers or the recently established Technology Transfer group. It is these collaborations that turn our ideas into working models that can be used in delivering care to real patients.

"Breakthrough learning most often occurs at the intersections of disciplines rather than within the orthodoxy of a single discipline. Can we find new ways to coalesce research and clinical teams to solve real-life problems in medicine, as well as transforming our understanding of biology?"

In previous issues of the Vision, we have highlighted VEI clinicians and researchers who are partnering with other Vanderbilt departments in discovery efforts. In our Spring 2007 issue, we shared an exciting collaboration – including the College of Arts & Science, Peabody College, the School of Engineering and the VEI – to study vision and the brain through the Vanderbilt Vision Research Center. The discoveries coming out of this partnership are making international headlines.

**Producing Results that Matter**

"To generate a meaningful impact on society, begin by thinking of patient care."

Significant vision impairment affects more than 2 million Americans and ranks behind only arthritis and heart disease as the reason for impaired daily functioning in Americans over the age of 70. At the VEI, we have been working toward discoveries that will prevent blindness and keep patients functioning at a high capacity.

**Diabetic retinopathy**

Research conducted by John Penn, Ph.D., and his colleagues suggests that penetrating ocular wounds, like those resulting from intraocular injections, effectively slow abnormal retinal and preretinal neovascularization, and that the wounds likely do so using the retina's own natural complement of proteins. This work has led his group to explore how they can harness this natural response into a new mode of treatment for the blinding aspects of diabetic eye disease.

**Glucoma**

David Calkins, Ph.D., and his lab are working with scientists to discover medical interventions that can slow the progression of neuro-degeneration of the eye – including promising possibilities for preserving ganglion cells and slowing the progression of glaucoma. And Louise Mawn, M.D., has developed an endoscopic surgical method that will allow us to accurately reach the optic nerve for direct administration of neuroprotective agents to the structure at risk.

**Macular degeneration**

A collaborative study by VEI researchers and Duke University Medical Center has found a single gene variation traceable to 43% of cases of macular degeneration, suggesting that a combination of treatments and lifestyle modifications could prevent this disorder. And a new collaborative study between the VEI macular degeneration group and the Vanderbilt Center for Human Genetics reported the importance of mitochondrial DNA abnormalities in the risk for development of AMD.

The Vanderbilt Eye Institute is not just sitting back and waiting for discoveries to translate into treatments – we’re also addressing the practical realities of living with eye disease. Jeffrey Sosnowski, O.D., has a patent pending on a pair of glasses that will help patients with macular degeneration read and thereby stay engaged with the world.

**Transferring Our Successes to Society**

"We need to lead in the aggressive evidence-based application of prevention and screening to the citizens in our region. Earlier diagnosis and effective prevention reduce the human and financial cost of disease."

Larry Merin, RPB, of the Vanderbilt Ophthalmic Imaging Center has developed a mobile screening device for diabetic retinopathy, and is taking the screening out to underserved populations that wouldn’t ordinarily receive it. Brad Kehler, O.D., as a volunteer for Prevent Blindness Tennessee, screens patients in Nashville and ensures they get the follow-up care they need.

Sean Donahue, M.D., Ph.D., and his staff – in collaboration with the Tennessee Lions Eye Program – have screened almost a million children worldwide for amblyopia and other vision-threatening diseases.

"Much of our impact on society can be created through our mission to teach the next generation of practitioners."

The VEI faculty is consistently in the forefront of developing new ways of teaching. Denis O'Day, M.D., chairs the medical school-wide Emphasis Program. David Morrison, M.D., John Penn and other faculty lead case study groups for the capstone course taught to graduating senior medical students. Laura Wayman, M.D., and the VEI education committee have transformed the VEI residency by redesigning the curriculum to include innovative transfer of surgical skills from the wet lab to the OR and to provide more hands-on experience with patients.

At the Vanderbilt Eye Institute, we are doing remarkable things and poised to make even greater contributions to vision care. Our outreach efforts are a benchmark of our success.
Larry Merin grins from ear to ear as he emerges from his office. “I’m so happy to get to talk about this,” he exclaims. He’s speaking of his program to take diabetic retinopathy screening to underserved populations in Tennessee and in Lima, Peru. Mr. Merin is assistant professor of ophthalmology at VEOI and head of the Vanderbilt Ophthalmic Imaging Center, or VOIC.

Through support from Vanderbilt and community organizations, VOIC operates a program serving a variety of clinics where medically vulnerable people with diabetes obtain general medical care. “Diabetic retinopathy is a wicked foe that cuts across all boundaries,” explains Merin. “By bringing specialist eye care to a general clinic, we are able to overcome many barriers to health care delivery, and linkage to preventive ophthalmology.”

The obesity epidemic in the U.S. has dramatically increased the incidence of diabetes. An estimated 23.6 million Americans have the disease and up to 54 million have pre-diabetic conditions (impaired glucose intolerance). By 2020, it is estimated that there will be 38 million people with diabetes.

Over 5.3 million of those with diabetes are affected by diabetic retinopathy. It is the leading cause of blindness for people aged 20-74: 12,000 - 24,000 people become blind annually from the disease. African-Americans and Latino-Americans have an increased likelihood of developing diabetic retinopathy.

But it is often the most vulnerable diabetes patients that don’t get the screening. Many disenfranchised would-be patients are elderly, poor, cannot speak English, or cannot get to the clinic because they live in rural areas. Those without adequate health insurance receive their diabetes diagnoses at primary care clinics, and are often unable to see an eye specialist.

“It is these populations that the VOIC outreach programs seek to reach,” says Merin. “We want to change the paradigm of diabetic ophthalmic care.”

Diabetic retinopathy establishes itself early in the disease. It can be controlled if detected early, preventing eventual blindness. A simple eye screening can detect retinopathy, and should be conducted when a person is first diagnosed with diabetes and annually thereafter. The disease’s progression can then be slowed through laser photoacogulation therapy.

While retinal imaging has been around since the 1880s, digital imaging has taken it to a completely new level. The mobile camera system used by Merin and the Vanderbilt Ophthalmic Imaging Center is what makes this outreach possible.

The VOIC diabetic retinopathy screening program screens patients where they customarily receive medical care - in internal medicine or primary care clinics. Screening cameras may be permanently installed in these offices, or VOIC takes a mobile unit to the office and screens patients by appointment.

VOIC began the program with at-risk patients in Nashville. In an unprecedented collaboration with Tennessee community health centers and safety net clinics, the program currently has fixed camera locations at several clinics in Nashville as well as at the Nashville and Murfreesboro VA Hospitals. The program expanded by collaborating with Community Health Network. Three mobile cameras service community health clinics in the west, middle and eastern regions of the state. Images are sent back to the VOIC for reading.

Last May, the VOIC began screening patients in county health departments throughout the region as part of “Project TennesseeSEEvii,” a state-funded program. Local ophthalmologists and optometrists work with the counties to see patients once sight-threatening diabetic retinopathy has been detected. Though the ongoing treatment is not free, it is subsidized.

Because of the quality of digital imaging, Merin and his deputy, Sandra Anderson, CRA, FOPS, can often detect other problems by looking into the eye. For instance, if they see plaque buildup – which typically has a 50% mortality rate in 5 years – they recommend that the patient get treatment. Screening for diabetic retinopathy thus begins to save lives as well as prevent blindness.

VOIC in Peru

In order to better understand the cultural, sociological and economic contexts of diabetes care, the VOIC has initiated a retinopathy screening program in Lima, Peru under the auspices of Vanderbilt’s Center for the Americas. Begun two years ago, this innovative project – with start-up funding provided by the university – brings together a multidisciplinary group of experts from a variety of institutions and disciplines, including nursing, psychology, health policy, sociology, endocrinology and ophthalmology.

Vanderbilt operates this program in collaboration with Universidad Peruana Cayetano Heredia in Lima. The project has attracted the attention and support of the Peruvian Ministry of Health and of the Pan American Health Organization.

The indigenous people of the Andes provide a perfect case study. Tired of subsistence farming and herding, they are moving to the city in record numbers. Away from daily physical labor and eating an unhealthy diet, they are being diagnosed with diabetes with an incidence similar to that of North Americans.

Research objectives for the program are to study diabetics’ self-care behavior, socioeconomic and cultural barriers to health care delivery, and clinical designs for chronic disease management, in addition to training local healthcare workers and aiding in the creation of other outreach projects. But the core foundation of the initiative is diabetic retinopathy screening.

98% of Peru’s ophthalmologists practice in Lima, but the cost of care and lack of education remain barriers to preventive ophthalmology. “There’s a stigma attached to diabetes,” says Merin. “Many still consult shamans, so getting the patient to the clinic can be difficult.” Merck has donated a van to help move the camera to remote clinics. Similar to the Tennessee program, the patients are screened and the images are sent back to a new reading center the VOIC helped establish in Peru, with the VOIC providing guidance and quality assurance.

Merin: “I can’t sit here and let people go blind when we have tools to prevent this catastrophe,” he says. “We want to give them hope.”
Brad Kehler, O.D., F.A.A.O., sees beyond the walls of the Vanderbilt Eye Institute. He is one of 60 optometrists and ophthalmologists across the state who volunteers with Prevent Blindness Tennessee (PBT) to screen needy patients for vision problems. In 2007, as part of its Senior Sight program, PBT volunteers provided 1,328 patients with vision screenings, 189 with complete eye exams, and 341 with eyeglasses.

Dr. Kehler has also been instrumental in coordinating PBT’s role in Project TennesseeWell (see article, page 6). PBT volunteers organize incoming data from screenings sites and from VOIC, input the data into a master database, send letters with patient educational materials to patients and, when possible, match destitute patients found to have sight-threatening disease with their own volunteer eye care providers.

In addition, PBT volunteers provided 47 eye exams and provided surgery or treatment for diabetic retinopathy to 5 patients in 2007. Kehler’s work with Prevent Blindness Tennessee has earned him the organization’s Support of Vision Volunteer Award. Today, he serves on the group’s Board of Directors.

When he isn’t donating his time and expertise to preventing blindness, Dr. Kehler is a full-time faculty optometrist at the Vanderbilt Eye Institute. In fact, he has been part of the Vanderbilt community since his undergraduate years (he’s still a big Commodore sports fan!). A Dallas, Texas native, he has been interested in a career in vision since high school.

“I have always been fascinated with how the human visual system processes information into what we perceive as sight,” he says. “And I was attracted to health care for the opportunity to serve society. Optometry seemed like the perfect profession since I could be involved in both vision science and patient care.”

After receiving his bachelor’s degree at Vanderbilt, Brad eventually returned to Nashville after earning a doctorate at the Illinois College of Optometry. His wife, Lori Ann, whom he met in optometry school in Chicago, is also a Vanderbilt optometrist specializing in pediatric optometry.

“We were both attracted to the university setting due to the ability to teach, see patients, and conduct vision research,” explains Kehler. “We plan on making a career in academia.” And they are making a family. The two have a new baby – their first.

With low vision and specialty contact lens fittings his subspecialties, Brad sees many patients in the VEI clinic with issues like glaucoma and diabetic retinopathy. But it’s the people he meets out in the field who really inspire him.

“Out in the clinics we screen at-risk patients,” says Kehler, “people who can’t make it to an eye clinic for health or economic reasons. Getting to these patients really puts a face on Vanderbilt’s work and research.”

Prevent Blindness screening sites are typically set up at a primary care office or walk-in clinic. The volunteer optometrists and ophthalmologists can screen up to 20 patients a day. During the screening process, Dr. Kehler sometimes uncovers problems that go beyond the eyes and require urgent attention.

One patient in her sixties complained that her vision had worsened. Dr. Kehler discovered a massive central retinal vein occlusion, or hemorrhagic stroke of the eye. He checked her blood pressure – and found it to be dangerously high.

“We contacted her primary care doctor on the spot,” he recalls. After organizing a follow-up appointment with the woman’s physician and a time and place for her to pick up blood pressure medication, Dr. Kehler placed her with a retina specialist to treat her vein occlusion. “We may have saved the patient’s life, in addition to saving her vision,” he says now. “While highly stressful, that was a feel-good moment because I know I made a difference for someone who desperately needed appropriate care.”

In his volunteer work and his practice at Vanderbilt, Brad finds it very rewarding to see an improvement in a patient’s quality of life. “I think it’s an obligation,” he says. “As physicians, we have a privileged position in society, and we definitely have the tools help others.”

But Kehler doesn’t just stop with vision. In addition to his practice and his volunteer work, he is an avid cyclist and represents the VEI in the annual “Jack and Back” ride for multiple sclerosis.
Vanderbilt Eye Institute researchers don’t sit back and wait for the latest treatments for vision problems—they’re inventing them. Currently VEI optometrists and ophthalmologists, in collaboration with other Vanderbilt faculty, have several important patents pending that could impact patients now.

**Illuminated Low Vision Glasses**

**Jeff Sonsino**

Dr. Jeffrey Sonsino has been interested in low vision ever since his years at the New England College of Optometry.

Today he sees patients in the Center for Sight Enhancement at Vanderbilt, where he has invented an innovative set of eyeglasses after carefully studying hundreds of patients with low vision.

Illuminated low vision glasses provide illumination, magnification, and prism correction that improve contrast and letter recognition. They are a godsend for patients who cannot properly read with ordinary reading glasses or contact lenses, and whose condition cannot be corrected with surgery. This often includes people afflicted with macular degeneration, diabetic retinopathy, glaucoma, cataract, and other vision-impairing eye diseases.

Dr. Sonsino’s glasses are portable, far less bulky, and easier to use than other low vision reading aids. High-powered LED lighting is built into the spectacle frame, illuminating the page through magnifying, high-powered lenses. Built-in prism correction allows sustained reading at the focal distance of the lenses. And unlike current low vision devices on the market, which run at thousands of dollars, illuminated low vision glasses can be inexpensively produced and do not require a medical prescription.

To take his idea to the next level, Dr. Sonsino approached Vanderbilt’s Office of Technology Transfer and Enterprise Development (OTTED). The OTTED licenses technology developed by Vanderbilt inventors and innovators, and assists in the start-up of companies which commercialize Vanderbilt technology.

They helped him get the model built, and included them in a portfolio of patents they were showing to a consulting group. The consultants ranked the glasses the number one most fundable idea.

The OTTED registers copyrights, markets and licenses patents, and negotiates agreements related to licensing and material transfer, and sponsored research. It distributes royalties and other income to the inventors.

“Tech Transfer offers a lot of support for doctors,” says Sonsino. “They take all the initial risk.”

This new technology has the potential to help millions of people afflicted with low vision. Dr. Sonsino feels that if it is low-cost and available over the counter, the sales potential is considerable. He may be right:

after a story on the glasses appeared on a Vanderbilt News and Public Affairs Web video, calls came in from patients all over the world.

“We want to have this in as many hands as we possibly can,” he explains.

The Aurora system (Northern Digital Inc, Waterloo, Ontario) – is an alternating current magnetic localizer which emits alternating-current magnetic fields. It consists of a field generator and a small coil sensor that can be embedded in catheters, needles and other instruments.

The eye’s extreme delicacy makes it very difficult to reach the region behind it. Until now, directly accessing the optic nerve has required an orbitotomy – a difficult, invasive procedure in which either the lateral bony wall of the orbit (eye socket) is removed (causing permanent facial scarring or disfigurement) or a rectus muscle is dissected from the side of the eyeball (and then later re-attached) allowing the eye to be carefully ‘rotated’ to expose the optic nerve.

Moving the eye in the socket can potentially damage the eye.

Even very small flexible endoscopes are problematic for orbital surgeries and biopsies. Orbital structures are of similar color, and traditional orbital landmarks are lost as the endoscope is moved through the orbit, and the orbital fat obscures the optic nerve.

Image guidance may help the transorbital endoscopic procedure—perhaps even eliminate the need for invasive surgery. The system developed by Mawn and Galloway — the Aurora system’s image guidance, coupled with an endoscope — may help the neuroprotective drug to travel to the optic nerve. With proper cutting tools, the endoscope can perform an optic nerve sheath fenestration.

“Being part of the process of taking a science fiction-like concept into a real working instrument has been very satisfying,” Dr. Mawn says of her collaborative work.

“The unique advantage of being a Vanderbilt faculty member is the world-class scientists who are on campus and willing to work with busy surgeons to make the concept of better treatments and safer surgeries possible.”
Glaucoma is generally considered a disease of front of the eye because a key risk factor is elevated intraocular pressure (IOP). But glaucoma blinds through the death of the optic nerve, which is in the back of the eye.

David Calkins, Ph.D., and his research team focus on understanding the mechanisms through which the optic nerve is sensitive to ocular pressure. “We don’t understand why,” says Dr. Calkins. “We know that the eye is very sensitive to its own pressure . . . but we still don’t know how IOP translates to degeneration.”

Intraocular pressure is controlled by the secretion of fluid from the ciliary body adjacent to the crystalline lens and the drainage of fluid through tiny channels located at the intersection of the iris and the cornea. Elevated intraocular pressure is the only modifiable risk factor for glaucoma and is currently treated in one of two ways: lowering IOP with eye drops or opening the drainage channels surgically.

Dr. Calkins and his colleagues have identified novel therapeutic targets – transient receptor channels – within retinal ganglion cells. Blocking these channels decreases the sensitivity to pressure and prevents the pressure-induced death of retinal ganglion cells in the laboratory. The team found that when they relieved neural sensitivity to IOP, they could prevent the degeneration of the optic nerve due to pressure at the back of the eye. Simply put, the therapeutic intervention would blunt the effect of the pressure.

“It’s like giving you a shot of novocaine before you go to the dentist,” explains Calkins. “You’re not removing the procedure. You’re just blunting the response to it.”

Dr. Calkins has filed a patent based on the idea that blocking mechanically sensitive pressure sensors in the retina and optic nerve is a means to reduce the risk of blindness associated with glaucoma.

“When you apply for a patent, there are such things as pure idea patents, but this is an application patent in the sense that we have garnered a significant amount of sensible data to support a claim,” explains Calkins. “Targeting these channels is a potentially therapeutic intervention,” he continues. “We back up that claim with a great deal of experimental results.”

Practically speaking, pharmaceutical intervention is the goal. The Office of Technology Transfer is working with Dr. Calkins and with a local patent law firm to develop industrial interest and licensing to get it out into the public domain.

**Portable Erbium: YAG Laser**

**Jin-Hui Shen & Karen Joos**

Laser physicist Jin-Hui Shen, Ph.D., shares a research suite with Karen Joos, M.D., Ph.D. As a clinician, Dr. Joos is exposed to specific patient cases and brings the needs of the patient to their research. Together the two have developed a patented prototype of a portable erbium:YAG laser that can be outfitted for eye surgery.

This new laser system is a perfect example of both interdisciplinary collaboration and translational research. As an active ophthalmic surgeon and free electron laser researcher, Dr. Joos knew that the 2.94 micron wavelength of this laser would be very useful for certain delicate microsurgical procedures.

Unfortunately, this wavelength is very difficult to deliver to the surgical site, because few optical fibers can transmit it in a reliable and efficient manner. With the problem of beam delivery in mind, Dr. Shen decided to remove the need for flexible fiber delivery all together, by creating a new Er:YAG laser that fits in the surgeon’s hand.

Shen’s idea was complex, requiring precision machining, optics, and electronics expertise and instrumentation. Despite considerable technical hurdles, he was able to construct a complete prototype system, which is now available for further experimental use by Vanderbilt researchers.

Dr. Shen: “At Vanderbilt, there are so many people with so much expertise working together. This collaboration accelerates the research process and gets the technology to market faster, helping physicians and patients.”

Jesse Shaver, Dr. Shen’s student collaborator, agrees. Mr. Shaver – a student in Vanderbilt’s M.D./Ph.D. Program – came to Vanderbilt with his own invention, and Dr. Shen has worked with him to perfect it. The affordable hand-held device uses rapid-scanning confocal microscopy to measure the thickness of the cornea. Because of its convenience and accuracy, it could ultimately replace the current eye drops/ultrasound method that is uncomfortable for patients and often unreliable.

Recent research indicates a strong statistical relationship between corneal thickness and glaucoma, so an easier way to measure the cornea could mean faster diagnosis and better treatment.

Shen’s lab is also working on an accommodative intraocular lens. This multifocal lens will replace the rigid lenses currently implanted following cataract surgery.

“Most basic science labs focus on biology,” explained Dr. Shen. “We’re inventing – understanding what the problem is or the disease process involved and finding the solution.”

Karen Joos discusses a new project with Jin-Hui Shen (photo by Anne Rayner)

**Targeting Pressure Sensitivity in the Optic Nerve**

**David Calkins**

Glaucoma is generally considered a disease of front of the eye because a key risk factor is elevated intraocular pressure (IOP). But glaucoma blinds through the death of the optic nerve, which is in the back of the eye.

Dr. Calkins and his colleagues have identified novel therapeutic targets – transient receptor channels – within retinal ganglion cells. Blocking these channels decreases the sensitivity to pressure and prevents the pressure-induced death of retinal ganglion cells in the laboratory. The team found that when they relieved neural sensitivity to IOP, they could prevent the degeneration of the optic nerve due to pressure at the back of the eye. Simply put, the therapeutic intervention would blunt the effect of the pressure.

“It’s like giving you a shot of novocaine before you go to the dentist,” explains Calkins. “You’re not removing the procedure. You’re just blunting the response to it.”

Dr. Calkins has filed a patent based on the idea that blocking mechanically sensitive pressure sensors in the retina and optic nerve is a means to reduce the risk of blindness associated with glaucoma.

“When you apply for a patent, there are such things as pure idea patents, but this is an application patent in the sense that we have garnered a significant amount of sensible data to support a claim,” explains Calkins. “Targeting these channels is a potentially therapeutic intervention,” he continues. “We back up that claim with a great deal of experimental results.”

Practically speaking, pharmaceutical intervention is the goal. The Office of Technology Transfer is working with Dr. Calkins and with a local patent law firm to develop industrial interest and licensing to get it out into the public domain.

Recent research indicates a strong statistical relationship between corneal thickness and glaucoma, so an easier way to measure the cornea could mean faster diagnosis and better treatment.

Shen’s lab is also working on an accommodative intraocular lens. This multifocal lens will replace the rigid lenses currently implanted following cataract surgery.

“Most basic science labs focus on biology,” explained Dr. Shen. “We’re inventing – understanding what the problem is or the disease process involved and finding the solution.”

Karen Joos discusses a new project with Jin-Hui Shen (photo by Anne Rayner)

**Portable Erbium: YAG Laser**

**Jin-Hui Shen & Karen Joos**

Laser physicist Jin-Hui Shen, Ph.D., shares a research suite with Karen Joos, M.D., Ph.D. As a clinician, Dr. Joos is exposed to specific patient cases and brings the needs of the patient to their research. Together the two have developed a patented prototype of a portable erbium:YAG laser that can be outfitted for eye surgery.

This new laser system is a perfect example of both interdisciplinary collaboration and translational research. As an active ophthalmic surgeon and free electron laser researcher, Dr. Joos knew that the 2.94 micron wavelength of this laser would be very useful for certain delicate microsurgical procedures.

Unfortunately, this wavelength is very difficult to deliver to the surgical site, because few optical fibers can transmit it in a reliable and efficient manner. With the problem of beam delivery in mind, Dr. Shen decided to remove the need for flexible fiber delivery all together, by creating a new Er:YAG laser that fits in the surgeon’s hand.

Shen’s idea was complex, requiring precision machining, optics, and electronics expertise and instrumentation. Despite considerable technical hurdles, he was able to construct a complete prototype system, which is now available for further experimental use by Vanderbilt researchers.

Dr. Shen: “At Vanderbilt, there are so many people with so much expertise working together. This collaboration accelerates the research process and gets the technology to market faster, helping physicians and patients.”

Jesse Shaver, Dr. Shen’s student collaborator, agrees. Mr. Shaver – a student in Vanderbilt’s M.D./Ph.D. Program – came to Vanderbilt with his own invention, and Dr. Shen has worked with him to perfect it. The affordable hand-held device uses rapid-scanning confocal microscopy to measure the thickness of the cornea. Because of its convenience and accuracy, it could ultimately replace the current eye drops/ultrasound method that is uncomfortable for patients and often unreliable.
One Million Kids and Counting

Tennessee Lions Outreach Program

Ophthalmologists agree that it is important to discover serious eye problems in children before age six because they are easier to correct. But at this young age, children cannot verbally express a problem or read an eye chart.

That’s where the Tennessee Lions Outreach Program comes in. For over ten years, the Tennessee chapter of Lions International has operated a statewide Outreach Program to detect the most common vision disorders that can lead to blindness in young children. A network of over 900 trained Lions Club volunteers provide free vision screening for pre-literate children at daycare centers, preschools, Sunday schools and other organized sites upon request. The program provides the infrastructure and follow-up to ensure that every Tennessee child who needs it receives quality vision care.

Today, the Tennessee Lions Eye Center (TLEC) screens 30,000 children annually and refers 4.5% of these to local eye professionals. A grant from the International Lions enables Vanderbilt staff to follow up on these referrals, increasing the percentage from 33% to 75%.

“Vanderbilt couldn’t have done this without the tremendous volunteerism and generous financial support of the Lions Club members across the state of Tennessee,” explains Sean Donahue, M.D., Ph.D., Outreach Director of the Lions Eye Center.

Most young patients seen by the outreach program are between six months and four years of age. Photographs are taken of the children’s eyes and examined for a variety of vision problems.

Results go to the Vanderbilt Ophthalmic Imaging Center, or VOIC, where they are interpreted, entered into Vanderbilt’s “First Glimpse” access database, and returned to the screening site. Dr. Donahue and other TLEC physicians review photos and make recommendations for follow-up treatment. Parents of children with imperfect vision receive a list of area eye care professionals who have agreed to see referrals from the screening program.

“Talk about an impact,” says Donahue. “We’re coming up on our one millionth child worldwide screened through Lions Club International!”

Project PAVE

Vanderbilt Eye Institute optometrist Jeffrey Sonsino is involved with a landmark Vanderbilt program called Project PAVE (Providing Access to the Visual Environment). The program serves Tennessee children and youth ages 3 through 21 who have visual impairments, providing them with comprehensive low vision services and preparing them for independent visual functioning to the greatest extent possible.

Project PAVE was started in 1994, when Ann Corn, Ph.D., wrote a small grant to include about 10 children in the Nashville Metro school system. Dr. Sonsino took over the project, funded by the Tennessee Department of Education, after many years of seeing pediatric low vision patients.

All services are without cost to families and schools. Supervisors of special education across the state receive written notice of Project PAVE services each August and are asked to disseminate the information to all teachers who have eligible students. Referrals are taken from local optometrists, ophthalmologists and directly from school systems.

Following the evaluation, parents and local education agencies receive written reports listing any recommendations the optometrists determine may be beneficial to the student. The report may include prescriptions for optical devices like monoculars, hand magnifiers and therapeutic contact lenses.

Prescriptions for optical devices are filled by Project PAVE without charge to families or schools. Once the devices are received, a Project PAVE staff member meets with the student, their parents, other family members and appropriate school personnel to train and discuss use and care of the devices.

“These are bright kids...they just don’t see well,” explains Sonsino. “It does them a disservice to put them in the classroom with children who have severe learning disabilities.”

“Project PAVE is a wonderful example of collaboration across many disciplines to provide a life-altering service for our patients.”

The Stereoscopic Atlas of Retinal Disease, known by retina specialists around the world as the “Gass Atlas”, is currently being updated by Vanderbilt Eye Institute faculty member Anita Agarwal, M.D. This will be the 5th edition of the reference work, which was originally published in 1963. The last update was in 1996.

J. Donald M. Gass graduated from Vanderbilt in 1950 and in 1957, received a medical degree and the Founder’s Medal from the Vanderbilt University School of Medicine. After medical school, he served an internship at the Wilmer Institute at Johns Hopkins and a fellowship at the Armed Forces Institute of Pathology.

Dr. Gass then joined the faculty of the newly established Bascom Palmer Eye Institute at the University of Miami, where he stayed for 32 years. He returned to Vanderbilt in 1995 and spent the remaining years of his career with the VEI. In 1999, when he was 70, he was named one of the ten most influential ophthalmologists of the 20th century.

The book uses simple language to describe the pathology of retinal disease. “It is almost written in the first person,” Dr. Agarwal explains. “The text is illustrated with highly detailed diagrams and photographs of actual cases. In the current edition, 90% of the patients included in the book were seen by Dr. Gass himself.

Dr. Agarwal: “We will supplement the data on the work that has already been described and add new cases. Most of the updates will involve technological advances in retinal treatment.”

She hopes to have samples of the new edition at the AAO conference in fall 2010. The book will be published by Elsevier in spring 2011.
The Vanderbilt Eye Institute is pleased to announce the following:

Paul Sternberg, Jr., M.D.
Named Chairman of the Board at Cheekwood Botanical Garden and Museum of Art, Nashville.

Association for Research in Vision and Ophthalmology (ARVO)
Paul Sternberg, Jr, M.D.
Named Vice President-Elect.

Franco Recchia, M.D.
Elected to the Program Committee of the Retina Section.

John S. Penn, Ph.D.
One of two candidates for Trustee of the Retinal Cell Biology Section.

Elected to the Program Committee this spring.

Grants and Awards
David Calkins, Ph.D.
R01 grant from the National Eye Institute entitled “Transient Receptor Potential Channels and Retinal Ganglion Cell Death in Glaucoma.”

Rachel Kuchtey, M.D., Ph.D.
Received an American Glaucoma Society Clinician Scientist Award.

John S. Penn, Ph.D.
New research contracts with Alcon Laboratories, Inc., Merck Pharmaceuticals and Celgene Corp.

Jiyang Cai, Ph.D.
R21 grant from the National Eye Institute entitled “Mitochondrial DNA variation and susceptibility to oxidative injury in the RPE”.

Rachel Kuchtey, M.D., Ph.D.
Received an American Glaucoma Society Clinician Scientist Award.

International Society for Eye Research (ISER)
John S. Penn, Ph.D., North American Councillor of ISER, played a leadership role in the planning, organization and management of the ISER Congress in Beijing, China in September. VEI faculty Jiyang Cai, Rachel Kuchtey and Penn presented their latest work.

Paul Sternberg, Jr., M.D.
Chair, Vanderbilt Eye Institute

Special interests: low-pressure glaucoma and pediatric glaucoma.

Jeffrey A. Kammer, M.D.
GLAUCOMA
Special interests: neovascular glaucoma and complicated glaucoma cases.

Brad Kehler, O.D., F.A.A.O.
OPTOMETRY
Special interests: low vision rehabilitation, specialty optics, contact lenses.

Lori Ann F. Kehler, O.D.
OPTOMETRY
Special interests: specialty contact lens fitting, both for adults and for children.

Steve J. Kim, M.D.
RETIAMA/RITREOUS
Special interests: uveitis.

Mark A. Knoll, M.D., J.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Cataracts, refractive surgery, secondary IOL implantation, corneal transplantation.

John Kuchtey, Ph.D.
VISION RESEARCH
Special interests: immunological aspects of anterior chamber pathology in glaucoma.

Rachel W. Kuchtey, M.D., Ph.D.
GLAUCOMA
Special interests: cellular and molecular mechanisms of aqueous outflow in glaucoma.

Patrick Lavin, M.D.
NEURO-OPTHALMOLOGY
Special interests: eye movement disorders, myasthenia, neuro-ophthalmology, headache and metabolic disorders affecting the visual system.

Jennifer Lindsey, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Cataracts, eyelid disorders, ocular trauma, diabetic eye disease, and glaucoma.

Louise A. Mawn, M.D.
NEURO-OPTHALMOLOGY/OCULOPLASTICS
Special interests: ophthalmic plastic surgery with a particular interest in orbital disease.

Karen M. Joos, M.D., Ph.D.
GLAUCOMA
Special interests: low-pressure glaucoma and pediatric glaucoma.

Jeffrey Sonsino, O.D., F.A.A.O.
OPTOMETRY
Special interests: refractive errors, corneal disorders, cataracts, glaucoma, diabetic eye disease, ocular trauma, and strabismus.

Jeffrey Sonsino, O.D., F.A.A.O.
OPTOMETRY
Special interests: complicated and difficult-to-fit contact lenses, and low vision rehabilitation of adults and children.

Uyen L. Tran, M.D.
CORNEA AND EXTERNAL DISEASE/LASER SIGHT
Special interests: corneal transplantation, cataract surgery, and refractive surgery.

Laura L. Wayman, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Director of Resident Training and cataracts.

Daniel S. Weikert, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Cataracts, refractive surgery, secondary IOL implantation, sports ophthalmology - team physician for Tennessee Titans and Nashville Predators.

Mark R. Melson, M.D.
OCULOPLASTICS
Special interests: ophthalmic plastic surgery.

Lawrence M. Merin, RBP, F.R.I.M.
OPHTHALMIC IMAGING CENTER
Special interests: retinal imaging, epidemiology and diabetic eye disease.

David Morrison, M.D.
PEDIATRIC OPHTHALMOLOGY
Special interests: strabismus, pediatric cataracts, and retinopathy of prematurity.

Denis, M. O’Day, M.D., F.A.C.S.
CORNEA AND EXTERNAL DISEASE
Special interests: ocular fungal infections.

John S. Penn, Ph.D.
VISION RESEARCH
Special interests: molecular basis of ocular angiogenesis.

Francescech, M.D.
RETIAMA/RITREOUS
Special interests: pediatric retinal disorders and retinal vascular disorders.

Chasidy D. Singleton, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: pediatric ophthalmology.

Jeffrey Sonsino, O.D., F.A.A.O.
OPTOMETRY
Special interests: uncomplicated and difficult-to-fit contact lenses, and low vision rehabilitation of adults.

Uyen L. Tran, M.D.
CORNEA AND EXTERNAL DISEASE/LASER SIGHT
Special interests: corneal transplantation, cataract surgery, and refractive surgery.

Laura L. Wayman, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Director of Resident Training and cataracts.

Daniel S. Weikert, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Cataracts, refractive surgery, secondary IOL implantation, sports ophthalmology - team physician for Tennessee Titans and Nashville Predators.

Mark R. Melson, M.D.
OCULOPLASTICS
Special interests: ophthalmic plastic surgery.

Lawrence M. Merin, RBP, F.R.I.M.
OPHTHALMIC IMAGING CENTER
Special interests: retinal imaging, epidemiology and diabetic eye disease.

David Morrison, M.D.
PEDIATRIC OPHTHALMOLOGY
Special interests: strabismus, pediatric cataracts, and retinopathy of prematurity.

Denis, M. O’Day, M.D., F.A.C.S.
CORNEA AND EXTERNAL DISEASE
Special interests: ocular fungal infections.

John S. Penn, Ph.D.
VISION RESEARCH
Special interests: molecular basis of ocular angiogenesis.

Francescech, M.D.
RETIAMA/RITREOUS
Special interests: pediatric retinal disorders and retinal vascular disorders.

Chasidy D. Singleton, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: pediatric ophthalmology.

Jeffrey Sonsino, O.D., F.A.A.O.
OPTOMETRY
Special interests: uncomplicated and difficult-to-fit contact lenses, and low vision rehabilitation of adults.

Uyen L. Tran, M.D.
CORNEA AND EXTERNAL DISEASE/LASER SIGHT
Special interests: corneal transplantation, cataract surgery, and refractive surgery.

Laura L. Wayman, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Director of Resident Training and cataracts.

Daniel S. Weikert, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Cataracts, refractive surgery, secondary IOL implantation, sports ophthalmology - team physician for Tennessee Titans and Nashville Predators.

Mark R. Melson, M.D.
OCULOPLASTICS
Special interests: ophthalmic plastic surgery.

Lawrence M. Merin, RBP, F.R.I.M.
OPHTHALMIC IMAGING CENTER
Special interests: retinal imaging, epidemiology and diabetic eye disease.

David Morrison, M.D.
PEDIATRIC OPHTHALMOLOGY
Special interests: strabismus, pediatric cataracts, and retinopathy of prematurity.

Denis, M. O’Day, M.D., F.A.C.S.
CORNEA AND EXTERNAL DISEASE
Special interests: ocular fungal infections.

John S. Penn, Ph.D.
VISION RESEARCH
Special interests: molecular basis of ocular angiogenesis.

Francescech, M.D.
RETIAMA/RITREOUS
Special interests: pediatric retinal disorders and retinal vascular disorders.

Chasidy D. Singleton, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: pediatric ophthalmology.

Jeffrey Sonsino, O.D., F.A.A.O.
OPTOMETRY
Special interests: uncomplicated and difficult-to-fit contact lenses, and low vision rehabilitation of adults.

Uyen L. Tran, M.D.
CORNEA AND EXTERNAL DISEASE/LASER SIGHT
Special interests: corneal transplantation, cataract surgery, and refractive surgery.

Laura L. Wayman, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Director of Resident Training and cataracts.

Daniel S. Weikert, M.D.
COMPREHENSIVE OPHTHALMOLOGY
Special interests: Cataracts, refractive surgery, secondary IOL implantation, sports ophthalmology - team physician for Tennessee Titans and Nashville Predators.
Bounds’ Portrait to Join Others at VEI

Vanderbilt’s resident training program in ophthalmology was begun in 1957. It was granted full approval in 1962 under the guidance of George W. Bounds, M.D., who served as acting chair of the department from 1958 until 1966. On Friday evening, October 10, 2008 VEI faculty, friends and Dr. Bounds’ family members gathered to celebrate Dr. Bounds’ contribution at the unveiling of his portrait. Joining the festivities were three ophthalmology heads: James Elliott, M.D., who joined Vanderbilt Ophthalmology in 1966 and was appointed chair in 1970, Denis O’Day, M.D., who was appointed to the position at Dr. Elliott’s retirement in 1992 and Paul Sternberg, M.D., current chair who came to VEI in 2003.

Dr. Bounds was a community-based ophthalmologist who continued his practice during the time he was affiliated with Vanderbilt. Honoring Dr. Bounds at the unveiling were his son, George, also a physician, Dr. Harry Jacobson, M.D., Vice Chancellor for Health Affairs, Dr. Sternberg and Dr. Jeff Balser, M.D., Ph.D., who was that day named the 11th dean of Vanderbilt University School of Medicine.