Eyewitness

THE NEWSLETTER OF THE HARVARD MEDICAL SCHOOL
Department of Ophthalmology

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Joan W. Miller, MD
Chief and Chair

NOTES FROM THE CHAIR

Leading a Revolution in Patient Care

In recent years, we have witnessed a revolution in human genetics brought about by the Human Genome Project. New insights into genetic variation have opened the door to potential advances in human health that, just two decades ago, made for a good science fiction novel. Today, we have the ability to decode the molecular blueprint of every individual, and use this information to significantly improve diagnostic, prognostic and therapeutic interventions for our patients. It's an exciting and pivotal moment in healthcare that promises to transform the science and practice of medicine, and vastly improve patient outcomes. Our new Ocular Genomics Institute at Mass. Eye and Ear, launched in September 2011, will embody our focus on bench-to-bedside research, and serve as the centerpiece of our mission in the HMS Department of Ophthalmology to bring personalized medicine to a 21st century reality.

A Groundbreaking Paradigm for Patient Care

Our strategy will combine clinical information from electronic medical records and imaging with genetic information derived from tissue and DNA samples, which are collected from Mass. Eye and Ear patients and stored in a state-of-the-art biorepository. By linking the genetic and clinical attributes of each patient, and using high speed computing to analyze the data, we will be able to pinpoint genetic variations that underlie the etiology of a host of different eye diseases. By studying and understanding these pathways, our investigators will be able to test new ways to treat disease, and to ultimately predict which therapies work best for individual patients.

With this foundation in place, we will be able to deliver unprecedented advances in patient care. Investigators will have, at their fingertips, a genetic blueprint for every patient that will allow our clinician scientists to customize therapies for each patient. By zeroing in on disease targets,

continues on page 4

Ocular Genomics Institute:
Genetic Therapies Offer Patients Hope for the Future

An Interview with Eric Pierce, MD, PhD, Director, Ocular Genomics Institute at Mass. Eye and Ear
Associate Director, Berman-Gund Laboratory for the Study of Retinal Degenerations

Dr. Eric Pierce is a clinician, educator, and leader in the area of inherited retinal degenerations, which (collectively) are a leading cause of blindness worldwide. Dr. Pierce's scientific efforts have helped lead to improved ways to address these conditions using genetic sequencing and gene therapy methods. Recently, he has used next-generation DNA sequencing to identify new retinal degeneration disease genes and to improve genetic testing for patients with inherited retinal disorders. He is also applying his genetic expertise to therapeutic discovery and helped demonstrate the safety and efficacy of gene therapy for the RPE65 genetic form of Leber congenital amaurosis, an early onset form of retinal degeneration. A recent follow-up study demonstrated the safety and efficacy of a second administration of gene therapy to the other eye of these patients.

Dr. Pierce earned a PhD in biochemistry at the University of Wisconsin-Madison and his MD at HMS/MIT Health Sciences and Technology Division. He completed his ophthalmology residency at Mass. Eye and Ear/HMS, followed by a combined

continues on page 6

Andrius Kazlauskas, PhD, Promoted to Professor of Ophthalmology

Andrius Kazlauskas, PhD

Andrius Kazlauskas, PhD, Senior Scientist and the Sinon Scholar in Retinal Research at Schepens Eye Research Institute/Mass. Eye and Ear, has been promoted to Professor of Ophthalmology at Harvard Medical School. Dr. Kazlauskas is a worldwide authority on intracellular signaling events that govern angiogenesis, and growth factor signaling in human disease as it relates to retinal diseases. His work has led to groundbreaking discoveries in signal transduction pathways by which growth factors drive cellular responses inherent in pathological processes such as angiogenesis and retinal membrane formation.

A native of Cleveland, Dr. Kazlauskas began his graduate work on signal transduction and growth factors at the College of Science at Cleveland State University (CSU), where he earned his PhD in chemistry in 1986. That same year Dr. Kazlauskas joined the Fred Hutchinson Cancer Research Center in Seattle, Washington as a post-doctoral fellow to continue his basic research investigations; it was here that he discovered the role of tyrosine phosphorylation proteins in the regulation of signal relay enzymes – an important breakthrough in the concept of conditional protein-protein interaction.

In 1991, Dr. Kazlauskas joined the faculty at the National Jewish Center for Immunology and Respiratory Medicine in Denver where he led his own laboratory for several years. His ongoing research work caught the attention of Dr. Wayne Streilein who convinced Andrius that his work could lead to important new insights and potential treatments for blinding eye diseases, including diabetic retinopathy and proliferative vitreoretinopathy. Luckily for the vision community, Dr. Kazlauskas made the leap, joining Schepens in 1996 to concentrate on translating basic science principles to understand the molecular basis of blinding retinal disease.

> **"Dr. Kazlauskas is an exceptional scientist whose novel research has provided the conceptual foundation needed to develop next-generation therapies to treat and prevent blinding retinal diseases. His ground-breaking discoveries exemplify the kind of fundamental science that is one of the great strengths of this department. I'm thrilled that his significant contributions to his field and to Harvard Medical School are being recognized."**
>
> —Joan W. Miller, MD

Dr. Kazlauskas has more than lived up to Dr. Streilein's prediction. In 2001, he dedicated his career full-time to vision research, where his studies have led to several novel and paradigm-shifting discoveries in several areas of basic and clinical science; today, he is recognized as an international leader in his field.

Dr. Kazlauskas' appointment to Professor of Ophthalmology at HMS is unique in more ways than one – reflecting not only his extraordinary scientific and educational contributions to vision science, but the fact that they have taken

continues on page 19

In this issue:

Notes from the Chair.....Cover

Ocular Genomics Institute: Genetic Therapies Offer Patients Hope for Future.....Cover

Andrius Kazlauskas, PhD Promoted to Professor of Ophthalmology..... 2

Neuro-Ophthalmology: A Unique Service with Big Impact 3

Ocular Genomics Institute: Team Profiles..... 8

The Ruthanne B. Simmons Lectureship in Ophthalmology Honors a Daughter's Legacy.....10

Register for the 2012 HMS Annual Meeting & Alumni Reunion Weekend!.....11

News from All Over 12

Save the Dates!..... 20

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HARVARD MEDICAL SCHOOL

Neuro-Ophthalmology:
A Unique Service with Big Impact

With only a handful of neuro-ophthalmology services in New England and fewer than 200 full-time neuro-ophthalmologists nationwide, Mass. Eye and Ear's Neuro-Ophthalmology Service is home to the region's largest and most comprehensive service to patients with central nervous system diseases that affect vision. The service began in the 1940s under the guidance of Dr. David Glendenning Cogan, one of the most seminal contributors to the fields of neuro-ophthalmology and ophthalmic pathology. In this same spirit of excellence, patients today receive the highest level of expertise and care available anywhere in the world from Mass. Eye and Ear's highly trained staff, three of whom are fully trained in both neurology and ophthalmology. Fewer than a dozen individuals are trained in both specialties worldwide and no other service has more than one faculty member with dual training.

With three full-time and two part-time faculty the combined knowledge and experience of the group are unmatched. Joseph F. Rizzo III, MD, the newly appointed HMS David G. Cogan Professor of Ophthalmology in the Field of Neuro-Ophthalmology, has directed the service since 2006. Under Dr. Rizzo's leadership, the service has doubled its clinical volume to just under 5,000 patient visits each year. An accompanying and steep rise in annual surgical case volume – from 4 cases to 84 cases – is a measure of the experience and expertise of HMS Assistant Professor, Dean Cestari, MD, who specializes in the medical and surgical treatment of patients with adult strabismus.

Dr. Rizzo's predecessor as the service director, Simmons Lessell, MD, the Paul A. Chandler Distinguished Professor of Ophthalmology at HMS and Director of Ophthalmic Medical Student Education, is one of the department's most eminent academicians and mentors, and a world authority in the neuro-ophthalmology subspecialty. Neal Snebold, MD, fellowship-trained in neuro-ophthalmology at HMS/Mass. Eye and Ear, serves as a preceptor in the department's highly competitive, clinical neuro-op fellowship program, and also trains residents and medical students in clinic. In September 2011, the service welcomed Rebecca Stacy, MD, PhD to its ranks; Dr. Stacy completed both residency training at Mass. Eye and Ear and combined fellowship training in Neuro-Ophthalmology and Ophthalmic Pathology as a prestigious Heed Fellowship awardee.

A Full Array of Services

The Neuro-Ophthalmology Service treats disorders such as optic neuritis, ischemic optic neuropathy, brain tumors involving the optic nerves or chiasm, strokes that cause visual loss or double vision, transient monocular blindness, migraine with visual symptoms, myasthenia gravis, multiple sclerosis, mitochondrial disease, muscular disease that affects the eye and patients who have unexplained visual loss. Members of the service also have a special interest and expertise in the management of patients who have giant cell arteritis, idiopathic intracranial hypertension and adult strabismus.

In the fall of 2011, the Neuro-Ophthalmology Service moved into renovated and expanded clinical offices at Mass. Eye and Ear to accommodate a steady rise in patient volume. Neuro-Ophthalmology now houses six state-of-the-art exam rooms doubling the clinical capacity of the original suite. The expansion has enabled increased patient through-put, reduced wait time, and allowed streamlining of the evaluation process, which can often be time-consuming due to the inherent complexities of many neuro-ophthalmic disorders.

According to Dr. Rizzo, the neuro-op service at Mass. Eye and Ear leads innovative translational research with the goal of turning the subspecialty of neuro-ophthalmology – a historically diagnostics-driven service – into one that offers therapeutics to patients blinded by neurological disease. For over two decades, Dr. Rizzo has devoted the lion's share of his basic/translational investigations to developing a retinal prosthesis that aims to restore some vision to patients with acquired blindness; in the late 1980s, he founded the Boston Retinal Implant Project (BRIP), a collaborative, multi-disciplinary research initiative for which he has since served as co-director. The Project currently has included up to 34 researchers from six academic centers.

continues on page 11

Notes from the Chair, continued from cover

we can maximize therapeutic benefits and reduce adverse side effects. This groundbreaking paradigm enables us to deliver optimal, patient-centered treatment while raising standards of care across the entire ophthalmic spectrum. Most importantly, it enables patients to make more informed healthcare decisions and lifestyle choices for themselves and their families.

Building Collaboration: Ambitious growth in all of our research programs, including our new Ocular Genomics Institute, requires a unified, expanded and dynamic research space that will carry our efforts forward well into this century. An exciting and bigger footprint is in the works; we've kicked off plans to build a dedicated state-of-the-art research center that will house the majority of Mass. Eye and Ear's basic and translational research programs in both ophthalmology and otolaryngology. Mass. Eye and Ear has already filed an Institutional Master Plan with the City of Boston, and details regarding the exact location, scope of plan and funding are being identified. By co-locating our research programs, laboratories and faculty under one roof, the new research facility will provide a centralized hub for inspiring innovation and translational studies among HMS faculty and affiliates. It will also create exciting new opportunities for expanding research and training initiatives and sustain our growth well into the future.

Beyond its clinical promise, the cost of whole genome sequencing for individuals – now approaching the $1,000 mark – is rapidly becoming a fast and relatively inexpensive method of diagnosing disease. For this reason, we can expect broad clinical adoption of these methods in the next few years. In the meantime, HMS scientists are already employing a new tool called an exome chip, which uses an inexpensive blood sample from the patient to screen for about 200,000 common gene variants that may be risk factors for disease. First applications of the chip will be risk assessment for common complex diseases, followed by individually tailored treatments for complex cases with multiple genetic factors.

A Preeminent Leadership Team

I am very proud of our exceptionally talented faculty members, who have proven success in genomics and gene therapy, and are eminently qualified to lead this ambitious effort. Our core leaders include: Dr. Eric Pierce, a worldwide leader in the genetics of retinal degenerations. Prior to joining Scheie Eye Institute, Dr. Pierce received extensive medical and research training at HMS; he rejoined us in September 2011 as Director of the Ocular Genomics Institute and Associate Director of the Berman-Gund Laboratory for the Study of Retinal Degenerations. Dr. Elizabeth Engle, from Children's Hospital Boston – a Howard Hughes Investigator and one the world's foremost experts in the genetics of strabismus – will oversee the Institute's Disease Pathogenesis section as Associate Director. Dr. Janey Wiggs, a highly accomplished clinician scientist whose body of work has provided critical information regarding the genetics and biology of glaucoma, will serve as Associate Director of the Institute's Genetic Diagnostics section.

We have also have recruited a hugely talented team of clinician scientists and researchers, from inside and outside the department, including Dr. Luk Vandenberghe, former Director of the Translational and Gene Therapy Program at the University of Pennsylvania's F.M. Kirby Center for Molecular Ophthalmology, who has successfully used next-generation viral delivery systems for genetic therapy; and Drs. Qui Zhang, Qin Liu and Donna Garland, from Scheie Eye Institute, who have joined the Pierce laboratory.

Their expertise will be paired with that of several HMS faculty who are conducting intensive genetic studies in several key areas: Dr. Eliot Berson, Director of the Berman-Gund Laboratory for the Study of Retinal Degenerations; myself and Ivana Kim, MD (AMD); Lucia Sobrin, MD, MPH (diabetic retinopathy); Louis Pasquale, MD (glaucoma); Evangelos Gragoudas, MD and Dr. Kim (ocular melanoma); Ula Jurkunas, MD (corneal dystrophies); and Jason Comander, MD, PhD (retinal degenerations). (See pages 8-9 for investigator profiles.)

Uniquely Positioned to Pave the Way

The Ocular Genomics Institute is already bringing the personalized medicine revolution to reality with the right people, technology and resources. With our dynamic leadership team in place, we are now moving forward on several fronts. These include the development of the biorepository to store DNA and tissue samples, the expansion of the molecular diagnostics laboratory to include next-generation DNA sequencing and genotyping capabilities, and the creation of a clinical registry with high-powered computing and software that will enable us to store, merge and analyze vast amounts of raw genetic and clinical data from patient electronic medical records.

Our department already houses several significant collections of DNA samples from patients with retinal diseases, glaucoma, ocular melanoma, and strabismus – making it one of the most robust repositories of genetic data available anywhere in the world. As personalized medicine gains traction, we can expect within a decade to be able to deposit DNA samples and genome sequences in the electronic medical records of 120,000+ patients treated annually at Mass. Eye and Ear. With eleven affiliate and partnering institutions and the sheer size and diversity of our patient populations, we will be able to quickly grow both our biorepository and clinical registry. In turn, robust data sources will enhance investigative teamwork carried out internally, and bring more opportunity for public and private funding to support associated costs (such as preclinical development and clinical trials).

Leveraging Bench-to-Bedside Capabilities

As a center of excellence for genomic and gene therapy studies, the Ocular Genomics Institute aims to catalyze collaborative and multidisciplinary investigations across the department. The union of Mass. Eye and Ear and Schepens Eye Research Institute is especially timely, and empowers the department with integrated, bench-to-bedside capabilities that fully dovetail with these goals. The department's Harvard-wide research/clinical affiliates – including Joslin Diabetes Center, Children's Hospital Boston and Beth Israel Deaconess Medical Center, Brigham and Women's Hospital, Veterans Affairs Boston Healthcare System, Cambridge Health Alliance – bring added depth with expertise in diabetes, strabismus, and pediatric disorders.

Positioned to Partner: The department has long been a major source for funding from government, industry and private organizations. However, with federal funds on the decline, we are increasingly focused on building industry-academia relations so that great ideas and discoveries continue to move seamlessly through every stage of the product development, clinical trial and regulatory pipeline. With a track record of success and a robust portfolio of talent and research programs in place, our department is well positioned to successfully partner with industry so that new discoveries are brought to market as quickly as possible.

Today, the HMS Department of Ophthalmology is comprised of close to 250 full- and part-time faculty. Our approximately 140 full-time researchers and clinician scientists, represent one of the largest eye research institutes in the world. At any given time, around 250 investigations – often collaborative and complementary – are ongoing, and more are in the works. These studies range from identifying genetic mutations and understanding how they cause disease, to identifying genetic risk factors, to designing and executing clinical trials, to developing better therapies for patients. With data in hand, researchers will have critical and actionable information that can potentially lead to better treatments and therapies for a host of ophthalmic diseases. From lab to clinic, faculty members are already leveraging the resources and expertise of the Ocular Genomics Institute to advance their efforts. I anticipate some exciting results as our efforts gain momentum.

Past Success Powers Future Innovation

Our department has a long and distinguished history as a bench-to-bedside powerhouse for translating scientific discovery into clinical triumphs. Dr. Charles L. Schepens, for example, revolutionized the practice of ophthalmology worldwide with numerous inventions and surgical techniques; these include innovations such as scleral buckling and open sky vitrectomy. Beginning in the 1950s, Dr. Claes H. Dohlman conceptualized and developed the Boston Keratoprosthesis (KPro), which has since become the most popular artificial cornea in the world – used in 50 countries with over 5,000 implantations to date. In the 1980s, Dr. Thaddeus Dryja, in collaboration with Drs. Stephen Friend and Robert Weinberg, discovered the retinoblastoma (RB) gene, the first known "tumor suppressor" gene; its protein product helps prevent uncontrolled cell division. The RB gene is altered in many familial and sporadic cases of human retinoblastoma, the most common eye tumor in children. Loss of RB function may lead to retinal tumor formation, and RB dysfunction has been implicated in many other types of cancer. In the 1990s, Drs. Dryja and Eliot L. Berson discovered the first gene defects associated with retinitis pigmentosa. And, just in the last two decades, a team of HMS ophthalmology and vision scientists led studies that identified the role of VEGF in neovascular ocular disease – revolutionizing treatments for age-related macular degeneration, diabetic retinopathy, retinopathy of prematurity, and diabetic macular edema.

The Ocular Genomics Institute puts us on a path to continue this translational success. As Dr. Pierce explains (see interview on cover), the work of the Ocular Genomics Institute is particularly exciting because of its potential to rapidly influence patient care. The Institute is structured so that clinically relevant issues may be identified through genetic testing, then addressed immediately in the laboratory. Similarly, laboratory discoveries can help inform clinical efforts – bringing this seamless process full circle. This connectivity of clinical and laboratory work will allow us to advance research and clinical care with unparalleled speed.

A Call to Action!

We have reached an exciting and unprecedented threshold in patient care that, one day soon, may lead to vast improvements in our quality of life – not just in ophthalmology, but across the full spectrum of human disease. Looking ahead, I believe the Ocular Genomics Institute at Mass. Eye and Ear/HMS is strategically positioned to serve as a premier center of excellence for ocular genomics and gene therapy research, and to deliver on the promise of personalized medicine.

We're off to a tremendous start but will need substantial financial, administrative and infrastructure support in order to bring our capabilities up to full capacity and stay ahead of the demands and challenges associated with this array of innovation and expansion. Funding these efforts will require your support - industry, key foundation partners, and generous friends and alumni. In the coming months and years we will be reaching out to our constituency to make sure that we stay the course. **Your support will make our vision possible.**

I look forward to sharing news of our advances with you.

> "Ultimately, we want to make personalized medicine an integral part of the clinical care we provide to all of our patients and lead discoveries that reduce the burden of blindness worldwide."
>
> —Eric Pierce, MD, PhD

Ocular Genomics Institute, continued from cover

research-clinical fellowship in pediatric ophthalmology at Children's Hospital Boston. He joined the faculty of Children's Hospital Boston working in clinical care and angiogenesis research for three years before being recruited to the University of Pennsylvania School of Medicine, where he worked between 1999 and 2011. He focused his work on retinal degenerations and was a member of the Division of Ophthalmology at Children's Hospital of Philadelphia; he attained the rank of Associate Professor of Ophthalmology with tenure at Penn.

What is your main goal as director of the Ocular Genomics Institute?

The HMS Department of Ophthalmology has a strong track record of translational success and excellence in patient care. My goal is to use the advanced resources of the Institute to build upon this foundation so we can quickly advance genomics and gene therapy research not just in my area of retinal degenerations but across every area of ocular disease. Ultimately, we want to make personalized medicine an integral part of the clinical care we provide to all of our patients and lead discoveries that reduce the burden of blindness worldwide.

In what areas are your efforts focused?

We've focused our immediate efforts on genetic research and gene therapy of inherited retinal disorders. We already have proof of principal studies that gene therapy can work for these disorders and we're using this knowledge as a springboard for further study. And this is just the beginning. Long-term we plan to collect DNA samples from all consenting ophthalmology patients at Mass. Eye and Ear so HMS investigators will have the genetic data and large statistical sample sizes they need to discover the cause of disease and conduct clinical trials that will advance treatments and cures. We'll also be well-positioned to quickly segue into whole genome sequencing.

How is the Institute structured?

The Institute will have six major components: a state-of-the-art biobank for collecting and storing DNA and tissue samples together with clinical information from patients' electronic medical record; a molecular diagnostics laboratory that uses modern genomic technologies to find genes that are causing disease or genetic outliers that may contribute to disease; and disease pathogenesis research to figure out how those misspellings trigger disease. We also have a strong genetic therapies program directed towards clinical trials and a state-of-the-art clinical care program for patients with ophthalmic genetic disorders. In addition, we're developing training programs in ophthalmic genetics for our medical students, residents, and fellows.

Is the Institute a unique endeavor?

It's not unique, but it is one of a few centers focused on genetics and gene therapies for ocular diseases. Thanks to several decades of ground-breaking research by Dr. Eliot Berson, Director of the Berman-Gund Laboratory for the Study of Retinal Degenerations, we house a very large collection of samples from patients with inherited retinal disorders, plus a fantastic collection of longitudinal clinical records detailing patients' retinal disease status.

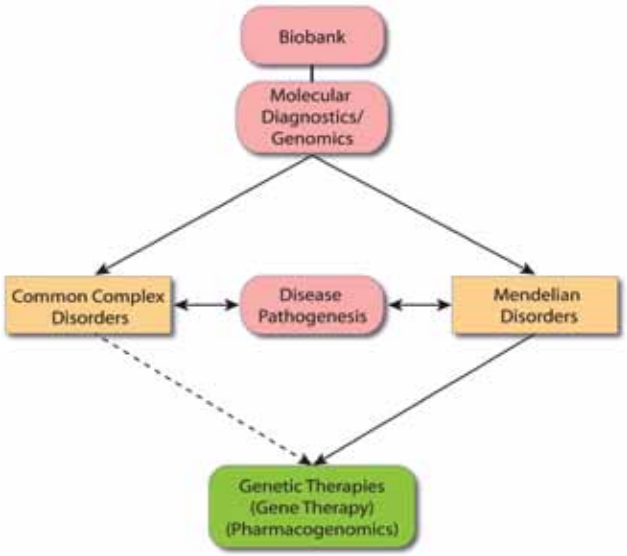
This is in addition to our significant clinical registries for AMD, melanoma, glaucoma and strabismus. This data is crucial to the numerous genetic investigations going on right now across the department. In fact, my lab may have just discovered a new disease gene in one of the Leber congenital amaurosis families. So already these clinical resources are accelerating our ability to search for and find specific disease-causing genes.

Another unique factor is that we're the only institution that can provide comprehensive screening to patients with inherited retinal disease – meaning we can search for all 200 known genes that may contribute to the disease – right here at Mass. Eye and Ear. This is critical in order to get an accurate picture of a patient's genetic status, and something we're doing right now in our research, and that I expect will be available shortly to patients.

Is the Institute up and running?

It is. Our first objective was to establish our leadership team and recruit a core group of investigators. We've had tremendous support from HMS and Mass. Eye and Ear leadership, and have assembled an incredibly strong group of multidisciplinary talent from inside and outside the department. As Director, I'll continue to focus my efforts on genomics and gene therapy for inherited retinal disorders. Associate Directors for the Institute, Dr. Janey Wiggs from Mass. Eye and Ear and Dr. Elizabeth Engle from our HMS affiliate Children's Hospital Boston, are acclaimed for their work in the genetics of glaucoma and strabismus respectively, and will continue their pioneering efforts in these areas.

Ocular Genomics Institute
Components, Technologies, and Applications



Our new venture extends across the whole department and integrates leading-edge, genetic work by a stellar group of HMS clinician scientists: Drs. Joan Miller and Ivana Kim (AMD); Lucia Sobrin (diabetic retinopathy); Louis Pasquale (glaucoma); Evangelos Gragoudas, Eliot L. Berson (retinal degenerations) and Dr. Kim (uveal melanoma); Ula Jurkunas (corneal dystrophy). I've also recruited some exceptional investigators to my lab, several of whom have joined me from Penn: Drs. Qin Liu, Donna Garland, and Qi Zhang. Dr. Luk Vandenberghe – an expert in gene therapy delivery who brings vital expertise to our overall efforts – joined our team this month, and Dr. Jason Comander will join us in July.

We've also made major investments in next-generation sequencing equipment, high-powered computing systems, and facility upgrades, all of which will expedite our efforts. Long-term, the Institute will comprise of a half-dozen laboratories situated together in the new Mass. Eye and Ear research facility that is now in the planning stages.

What's next?

Now that our efforts are in full swing, we're reaching out across the broader department to make our staff and resources available to faculty who are conducting genetic-based studies. Our support can range from providing access to next-generation sequencing to establishing collaborative efforts to conducting diagnostic testing. The ultimate goal is to provide critical information that investigators can use to develop better prognostic and diagnostic tests and – in some cases – disease prevention measures. This is an exciting proposition and one that, I expect, will really fuel opportunities for collaboration and discovery not just throughout HMS ophthalmology but with outside organizations as well.

In what ways will your efforts impact clinical care?

With inherited retinal degenerations, many patients know they have a retinal dystrophy or disease but they don't know what kind. The next-generation sequencing technology that we're using in the Ocular Genomics Institute enhances our ability to carry out genetic research and vastly improves the odds that we'll find the specific gene that is causing an individual's disease. This means we can give patients a definitive diagnosis and a more accurate prognosis of the course of their disease. For patients, it removes a lot of the uncertainty and anguish that comes from living with an undiagnosed disease. It's also very helpful to families who may want to know what the risks are of passing their disease on to their children.

Another major benefit is that genomics-based research gives us an entrée into therapy. I've participated in one of the clinical trials of gene therapy for the RPE65 genetic form of Leber Congenital Amaurosis, an early onset form of retinal degeneration. Each of those trials shows that the therapy is working. We believe that we can apply this same approach to many other types of retinal disease.

Is the eye a good sight for gene therapy?

It is. The eye is a small, accessible and isolated organ so we can treat patients with a minimal amount of gene therapy drug. This lowers the risks and side effects to the eye and

continues on page 19

Janey Wiggs, MD, PhD
Associate Director,
Genetic Diagnostics Section

HMS Associate Professor of Ophthalmology, Dr. Janey Wiggs is a highly accomplished clinician scientist and an international leader in the genetics of glaucoma. As Associate Director of the Ocular Genomics Institute, Dr. Wiggs will lead the Genetics Diagnostics Section, an effort that utilizes next-generation sequencing techniques to elucidate the pathology of a wide range of ophthalmic diseases. Since 2005, Dr. Wiggs has directed the CLIA-certified diagnostic laboratory (Clinical Laboratory Improvement Amendments) at Mass. Eye and Ear – part of the eyeGENE network of diagnostic laboratories – which currently offers genetic testing to patients with some types of glaucoma and optic neuropathies. The CLIA laboratory is a key component of the Institute and will expand its genetic testing capabilities.

Continuously funded by the NIH since 1991, and as PI, she is currently investigating the genetic etiologies of several forms of glaucoma including, pseudoexfoliation glaucoma, early-onset glaucoma (congenital glaucoma, pigment dispersion syndrome and pigmentary glaucoma, glaucoma associated with Rieger syndrome and juvenile open angle glaucoma), as well as genes contributing to ocular quantitative traits that are risk factors for glaucoma development. In collaboration with Dr. Louis Pasquale, she is also principal investigator of the NEIGHBORHOOD project, which is a multicenter center cohort study to identify genetic risk factors for adult onset primary open angle glaucoma.

Elizabeth Engle, MD
Associate Director,
Disease Pathogenesis Section

Dr. Elizabeth Engle is Professor of Neurology and Ophthalmology at HMS and a world-renowned pioneer in the genetics of complex and common strabismus. An investigator of the Howard Hughes Medical Institute, Dr. Engle's research has uncovered seven different forms of strabismus arising from a variety of genetic errors in brainstem motor neuron development. This body of work defined a new category of congenital disorders that leave children unable to move their eyes in specific directions, and has led to important new insights into brain development.

As Associate Director of the Ocular Genomics Institute, Dr. Engle will apply her wealth of expertise in studying the molecular etiology of new genetic disorders to the Disease Pathogenesis Section of the Institute. The main focus of this area will be to help elucidate the underlying factors that lead to vision disorders with a genetic predisposition (for both inherited and common complex diseases). This will enable HMS investigators to begin to develop rationally designed therapies and disease prevention methods for a host of ocular diseases.

Members/Investigators

Eliot Berson, MD, director of the Berman-Gund Laboratory, has been a pioneer in retinal degeneration research for over four decades. Dr. Berson continues to make a concentrated effort to isolate genes responsible for retinitis pigmentosa, and to conduct genotype/phenotype correlations whenever possible. Disease course can now be followed with computerized electroretinography (ERG), thus defining rates of progression in patients with known gene defects. He is conducting factor analyses to identify dietary factors that may modify disease course. Additionally, he is using knockout and transgenic murine models of human disease to elucidate pathogenic mechanisms a cellular level – thus providing a foundation for potential gene therapies.

Jason Comander, MD, PhD, focuses his research primarily on the genetics of inherited retinal diseases and translational research designed to improve treatments for patients with these disorders. Dr. Comander is currently exploring the genetic basis of distinct forms of retinitis pigmentosa, investigating methods to assay the functional significance of human mutations, and developing and testing techniques for retinal gene therapy in primates. As a member of the Institute, he will be working closely with Dr. Pierce and Dr. Eliot Berson, Director of the ERG Service and the William F. Chatlos Professor of Ophthalmology.

Donna Garland, PhD, has spent most of her career as a tenured scientist in the National Eye Institute (NEI) using proteomics to study tissues in the front of the eye. She joined the Scheie Eye Institute as a senior research investigator to apply proteomics and mouse genetics to the study of macular degenerations. These studies have demonstrated a requirement for the complement system in the development of drusen-like deposits in a mouse model used to study dry age-related macular degeneration. As an investigator in the Institute, she will continue to research the mechanisms underlying the role of complement in macular degenerations.

Qin Liu, MD, PhD, is using a combination of genetically modified animal models and molecular approaches to investigate several candidate disease genes for various forms of inherited retinal degenerations and related ciliopathy disorders. She is also co-investigator of an NEI grant to Dr. Pierce to study the pathogenesis of one of the common forms of retinitis pigmentosa, RP1. Her investigations have found that the RP1 protein is a photoreceptor microtubule-associated protein that is required for the correct formation of

photoreceptor sensory cilia (PSCs). She now aims to identify proteins that interact with RP1 in order to further define how it participates in PSC formation, and study how its mutations lead to photoreceptor cell death. She is also testing potential therapies for RP1 disease, including gene augmentation therapy, in mice.

Luk Vandenberghe, PhD, specializes in the design and development of novel gene therapy vectors for ocular indications. Most recently, he held the position of Senior Research Investigator in the laboratory of Dr. Jean Bennett at the F.M. Kirby Center for Molecular Ophthalmology, Scheie Eye Institute at Penn. Dr. Vandenberghe played a key role in the development of next generation clinically relevant gene vectors that enable broad targeting of the retina. He serves as an active member on several committees of the American Society of Cell and Gene Therapy. As a member of the Ocular Genomics Institute, his new lab will be situated at the Schepens building, supported in part by funding from the Foundation for Fighting Blindness and the National Institutes of Health.

Qi Zhang, MD, PhD, is working to define the role of a novel cilia gene in cilia function, and its relevance to human retinal diseases through functional analyses of the gene. He is utilizing both in vitro and in vivo approaches in different model systems, including cell culture, rodents and zebrafish. A second project utilizes next-generation exome sequencing technology to search for mutations in human patients with Leber's congenital amaurosis, an inherited retinal degenerative disease. Dr. Zhang and colleagues are using several approaches to fulfill their goal, which are genetic and functional analyses. To prove the mutations contribute to the patient phenotype, they are using molecular and genetic techniques, in addition to biochemical methods.

Neena Haider, PhD, aims to identify and evaluate genetic determinants underlying retinal diseases and develop appropriate therapeutic interventions to prevent and treat the blindness associated with these disorders. Her research includes genetic models for Mendelian retinal diseases such as Retinitis Pigmentosa, as well as for complex diseases such as macular degeneration and diabetic retinopathy. In collaboration with the Ocular Genomics Institute, Dr. Haider is developing models for studying how genes function and impact these diseases. Her laboratory recently identified a genetic modifier that is able to ameliorate retinal degeneration. Her research also revealed a novel role for Vitamin D metabolism in the pathogenesis of age-related macular degeneration and antioxidants in neuroprotection from light-induced retinal damage. Dr. Haider has also developed unique genetic models to study the retinal and vascular phenotype associated with macular degeneration.

Ula Jurkunas, MD, focuses her research on the pathogenesis of Fuchs endothelial corneal dystrophy (FECD) with emphasis on how oxidative stress causes molecular and cellular damage in the susceptible FECD endothelium. Her goal is to determine specific cellular mechanisms that can be manipulated to reverse endothelial cell degeneration. These genetic studies will help scientists understand the key regulators of antioxidant defense and oxidative stress-induced cellular damage, and may facilitate development of pharmacotherapeutic treatment for FECD patients. As one of the department's first K12 awardees, Dr. Jurkunas laid the groundwork for the proposed research by developing experimental systems to test the proposed hypotheses.

Ivana Kim, MD, aims to discover molecular targets for AMD therapy, and has been involved in a genetic study of neovascular AMD involving extremely discordant sibling pairs. This method has been shown mathematically to be the most powerful approach for studying complex genetic disorders. By collecting genetic and epidemiologic data on these sibpairs, Dr. Kim is able to study gene-environment interactions, perform candidate gene analyses, and analyze gene expression profiles. In addition to confirming previously established genetic risk factors for AMD, Dr. Kim and colleagues have described novel gene associations that may be important in AMD pathogenesis, and are engaging in further functional studies.

Louis Pasquale, MD, is interested in how genes and environment interact in primary open-angle glaucoma (POAG). As an Institute investigator, he will move beyond high throughput analysis of common variants to whole exome/genome sequencing to discover novel genetic loci associated with POAG. He will use a unique endophenotype approach focused on retinal vascular dysregulation in POAG. Using cases matched to comparison subjects on the basis of several criteria, his goal is to identify genetic loci that contribute to disc hemorrhage in POAG. He will use sibs of cases and comparison subjects to filter sequence data in order to zero in on the genetic variants of interest. The discovery of genetic loci that contribute to disc hemorrhage could lead to new therapeutic targets for POAG.

Lucia Sobrin, MD, MPH, joined the department in 2006 as a member of the Harvard Vision Clinical Scientist Research Program (K12). Dr. Sobrin has been studying the genetics of macular degeneration and diabetic retinopathy. She is principal investigator on an admixture genetic association study and a genome-wide association study of diabetic retinopathy in African Americans; additionally, she is leading a candidate gene association study of diabetic retinopathy within the Candidate gene Association Resource (CARe), which includes participants from several large population-based cohorts.

Dr. Richard Simmons with his wife, Anne.

Consider a Gift!

We invite you to join the Alumni Giving Society of HMS Ophthalmology @ Mass. Eye and Ear for 2012. Your generosity supports the vital work carried out throughout the department and helps deliver the finest teaching experience to our residents and fellows. It is also a special way to pay tribute to beloved mentors, colleagues, or family members through support of named gifts. You may designate your gift in any way you choose. If you would like to learn more, please contact Melissa Paul at (617) 573-4168 or Melissa_paul@meei.harvard.edu.

"When I arrived at the Mass. Eye and Ear in 1959, I had no expectation of the magnificent and exciting career that would be given to me, my wife, Anne, and eventually to our eldest daughter, Ruthanne. Once inside the magical walls of the MEEI, I gradually discovered many inspiring role models, especially Dr. Edwin Dunphy, Dr. David Cogan, Dr. Morton Grant, Dr. Charles Schepens, and my hero, Dr. Paul Chandler. These great doctors of my early years were exemplary of what, to me, the Mass. Eye and Ear Infirmary was, is and will forever be – a superlative source of inspiration, encouraging integrity, excellence, long hard work and giving back to the art and science of our profession."

—Richard J. Simmons, M.D.

The Ruthanne B. Simmons Lectureship in Ophthalmology Honors a Daughter's Legacy

A second generous gift in as many years from HMS Department of Ophthalmology alumnus, Richard Simmons and his wife, Anne, will be used to establish the Ruthanne B. Simmons Lectureship in Ophthalmology. The lectureship, which gives first preference for glaucoma or glaucoma-related topics, honors the life and career of the Simmons' daughter, Ruthanne, on the occasion of her 25th anniversary and Dr. Simmon's 55th, from Harvard Medical School. This year marks the tenth anniversary of Ruthanne's passing.

The lectureship gift of $100,000 comes on the heels of the establishment in 2011 of the Richard J. Simmons and Ruthanne B. Simmons Fellowship Fund. This gift provides partial fellowship support to a succession of Simmons Fellows in the Glaucoma Service at Mass. Eye and Ear and will help to ensure well-trained specialists for decades to come. Dr. Simmons seeded the fund personally and, with generous support from 46 colleagues and friends, raised the remaining funds needed to meet the minimum $250,000 threshold.

Dr. Richard Simmons completed his ophthalmology residency at Mass. Eye and Ear in 1962. For four decades, Dr. Simmons enjoyed a career as a pre-eminent glaucoma specialist in Boston – first as a student and colleague of Mass. Eye and Ear luminaries Drs. Paul Chandler and Morton Grant, and later as the mentor of an entire generation of glaucoma specialists. He was President of the Professional Staff of Massachusetts Eye and Ear Infirmary, President of New England Ophthalmological Society (NEOS), one of the four founders and President of the American Glaucoma Society, one of the four founders and President of the Chandler Grant Glaucoma Society, and author of more than 66 peer-reviewed papers and numerous book chapters on glaucoma. Dr. Simmons taught intensively as a fellowship preceptor and as a frequent guest lecturer nationally and internationally.

Dr. Simmons' daughter, Ruthanne Simmons, followed in her father's footsteps. Thirty years after her father, she too, graduated from Harvard Medical School with her MD. Upon completion of her residency and glaucoma fellowship at Duke University Medical Center, Ruthanne joined her father in his ophthalmology practice. Later they practiced together at Ophthalmic Consultants of Boston. She operated at Mass. Eye and Ear and taught in the HMS Department of Ophthalmology. Like her father, Ruthanne was also active in many professional societies, including the American Academy of Ophthalmology, the American Glaucoma Society, NEOS, and others. She was an active researcher, teacher and author, and an invited speaker nationally and internationally on glaucoma-related topics.

Tragically, Ruthanne's journey was cut short. In 1996, she was diagnosed with breast cancer. She stopped practice for a year to undergo aggressive treatment, and successfully returned to active practice for four more years. Sadly, the cancer returned again, and this time, it overcame her. It was a great loss when Ruthanne passed away in 2002.

"Once again, we are so grateful to Dr. Simmons and his wife, Anne, for their exceptional generosity to this department," notes chief and chair Dr. Joan Miller. "Through these gifts, we will continue to celebrate Ruthanne's legacy as an outstanding clinician, teacher and researcher, and her parent's stalwart commitment to our continuing mission of training the best glaucoma specialists in the world."

The first Ruthanne Simmons Lecture will be held on November 14, 2012 with guest speaker Joel Schuman, MD, Chairman of the Department of Ophthalmology at the University of Pittsburgh, who is considered to be one of the nation's leading authorities on the treatment of glaucoma. Dr. Schuman was recently honored with a prestigious Carnegie Science Award in the Life Sciences award category. (See profile and story on page 18.)

Harvard Medical School
Massachusetts Eye and Ear Infirmary

Ophthalmology

Annual Meeting & Alumni Reunion Weekend

Alice R. McPherson, MD

Joan M. O'Brien, MD

The weekend's festivities kick off **Friday, June 8**, at Boston's Liberty Hotel with the Annual Meeting of the HMS Department of Ophthalmology. Highlights include: a basic/clinical poster session showcasing the current research activities of our trainees; presentation of the Distinguished Alumni Professional Achievement Award to Alice R. McPherson, MD, Class of 1957; and the Mariana D. Mead Lecture given by Joan M. O'Brien, MD, Class of 1992. At the end of the day, enjoy a reception and dinner celebration at the beautiful Four Seasons Hotel.

On **Saturday, June 9**, we'll begin our Alumni Reunion with an introduction of the Class of 2012 graduates. This will be followed by representatives from 10 quinquennial graduating classes (1962–2007) who will present lectures covering a wide range of eye diseases and topics. Tours of Mass. Eye and Ear will be offered both Friday and Saturday at the conclusion of the each day's presentations.

Sunday, June 10, is the day to take in the sights and sounds of Boston. We have a group trip planned to the Museum of Fine Arts and a limited number of tickets are available for purchase to watch the Boston Red Sox take on the Washington Nationals at historic Fenway Park.

JUNE 8-10, 2012

Please join us for the 2012 Harvard Medical School / Mass. Eye and Ear Ophthalmology Annual Meeting and Alumni Reunion Weekend, June 8-10. Residency and fellowship alumni, current trainees, and all current and former faculty members are invited to attend this exciting three-day event of scientific exchange, networking events, and social activities.

Last year's meeting drew rave reviews and a capacity crowd, including more than 90 alumni. This year's festivities are shaping up to be just as exciting. **An event not to be missed!**

For event and registration details, visit us online at: **www.masseyeandear.org/annualmeeting**

Questions? Please call the Development Office at (617) 573-3345 or email Alumni_Reunion@meei.harvard.edu. The Mass. Eye and Ear Development Office is available to help facilitate your return home to the Infirmary!

Complimentary CME credit is available, supported by the HMS Department of Ophthalmology.

REGISTER TODAY!

Neuro-Ophthalmology, continued from page 3

In other translational research Dean Cestari, MD, and colleagues are developing an animal model for ischemic optic neuropathy and central retinal artery occlusion; these investigations, which are supported by a Harvard Medical School Catalyst Grant, will eventually enable Dr. Cestari to evaluate the safety and efficacy of novel neuro-protective agents to preserve and restore vision affected by vascular occlusion. Dr. Stacy's studies intersect neuro-ophthalmology and pathology, and have involved multi-center collaborations with pathologists at other institutions, including Mass. General Hospital (MGH).

Medical students, ophthalmology residents and neuro-ophthalmology clinical research fellows benefit immensely from the service's innovative work, ongoing collaborations and excellence in teaching. During rotations on the service, residents and medical students receive one-to-one instruction in the evaluation and management of neuro-ophthalmic disorders. The Neuro-Ophthalmology Fellowship at Mass. Eye and Ear, directed by Dr. Rizzo, provides intensive training in both ophthalmology and neurology.

A long-time consultative – and now formal – collaboration with MGH is key training ground for fellows who learn to evaluate and manage a broad spectrum of neuro-ophthalmic conditions that affect the eye, and cases of unexplained vision loss. Both faculty and clinical fellows from the Neuro-Ophthalmology Service work closely with MGH's neurologists and neurosurgeons, and conduct, on average, 540 inpatient consults for MGH services annually. ■

According to Dr. Rizzo, the neuro-op service at Mass. Eye and Ear leads innovative translational research with the goal of turning the subspecialty of neuro-ophthalmology – a historically diagnostics-driven service – into one that offers therapeutics to patients blinded by neurological disease.

Annual Mass. Eye and Ear Vitreoretinal Course for First-Year Retina Fellows

July 20-21, 2012
Mass. Eye and Ear

Course Directors: Dean Eliott, MD, John Loewenstein, MD, and Demetrios Vavvas, MD, PhD

Now in its 3rd year, this unique and comprehensive workshop for first-year vitreoretinal fellows covers the theory and practice of vitreoretinal surgery and prepares fellows for the OR experience of the clinical fellowship. Participants join a distinguished group of world-class faculty in lectures, panel discussions, wet labs, video, and "dry labs" outfitted with EyeSi virtual reality simulators. Emphasis on hands-on training and a low student-teacher ratio ensures a significant educational experience. Each year, this highly popular workshop fills to capacity so don't wait to register!

Visit **www.masseyeandear.org/VRcourse** to register.

Second Biennial Symposium on AMD

September 21-22, 2012
The Starr Center, Schepens

Committee Co-Chairs: Patricia A. D'Amore, PhD, MBA, Ivana K. Kim, MD, and Joan W. Miller, MD

Our 2010 inaugural symposium drew rave reviews from participants and we look forward to another exciting event this year. On hand will be international experts from a diverse array of fields, as well as leaders from related disciplines. An interactive format engages lively discussion and debate during panel sessions. Topics include genetics, RPE/Bruch's membrane/choriocapillaris, inflammation, stem cells and tissue engineering, imaging, animal models, drug delivery, and neurodegenerative disease.

Please visit **www.schepens.harvard.edu/amd_symposium** to view our preliminary agenda and to register.

Ophthalmology Grand Rounds

Academic Year July 2011-June 2012

Grand Rounds are held every Thursday from 8:00-9:00 AM in Meltzer Auditorium, 3rd Floor, Mass. Eye and Ear and simulcast to the Karp 11 conference room at Children's Hospital Boston. Continuing Medical Education credit is available. A monthly list is posted at **www.MassEyeAndEar.org**.

Invited Grand Rounds Speakers

April 26, 2012: Quality, Humanism and Professionalism Program Quarterly Lecture. Speaker: Gene Beresin, MD, Department of Psychiatry, Massachusetts General Hospital

June 7, 2012: Neuroscience Grand Rounds at MGH Etherdome. Speaker: Eric Pierce, MD, PhD, Mass. Eye and Ear

Cornea Rounds

Cornea Rounds are hosted by the HMS Cornea Center of Excellence the 4th Wednesday of every month. MEEI Sloane Room, 3rd floor.

Upcoming Events

The HMS Department of Ophthalmology sponsors an extensive array of special lectures and courses. For details, please consult the Ophthalmology Education section at **www.MassEyeAndEar.org**.

For a complete listing of Schepens events please visit: **http://www.schepens.harvard.edu/events_seminars/index.php**

Pediatric Ophthalmology Visiting Professor Lecture Series

Children's Hospital Boston (video link to Mass. Eye and Ear)

July 25, 2012: Susana Marcos, PhD, Instituto de Optica, Madrid, Spain

Schepens Distinguished Lecture Series

Schepens, Conference Room 2

April 26, 2012: Angus W. Thomson, PhD, DSc, University of Pittsburgh School of Medicine. **Topic**: Tolerogenic Dendritic Cells and the Quest for Transplant Tolerance

June 7, 2012: Jeffrey A. Bluestone, PhD, University of California, San Francisco. **Topic**: Controlling Autoimmunity through Regulatory T Cells – Basic Research and Clinical Challenges

Annual Harvard Intensive Cataract Surgical Training Course for Second-Year Residents

May 19-20, 2012

Mass. Eye and Ear

Course Directors: Sherleen Chen, MD and Roberto Pineda II, MD

Visit **www.MassEyeAndEar.org/for-professionals/ophthalmology/meetings-courses/**

5th Military Vision Research Symposium

September 18-20, 2012

Starr Center, Schepens

Attendance options are available in four defined categories. For information and to register, please visit **www.schepens.harvard.edu/military_conference/military_symposium.html**

Harvard Glaucoma Joint Lab Meeting

Schepens, 2nd floor conference room

May 23, 2012: Dong Feng Chen, MD, PhD, Schepens/Mass. Eye and Ear

Cornea Research Seminar

Schepens, 2nd floor conference room

May 18, 2012: Pedram Hamrah, MD, Mass. Eye and Ear

June 22, 2012: Darlene Dartt, PhD, Schepens

Department of Ophthalmology Residents and Fellows Graduation and 2012 Annual Meeting & Alumni Reunion

June 8-10, 2012

Mass. Eye and Ear

Awards, Grants & Other Honors

HMS Associate Professor of Ophthalmology **Teresa Chen, MD**, FACS, has been named the 2012 President of the Chandler-Grant Glaucoma Society. The society's mission is to work for the prevention of blindness from glaucoma through integration of research and clinical disciplines. The society sponsors the annual Chandler-Grant lectureship and an associated clinical forum.

HMS Professor of Ophthalmology, **James Chodosh, MD, MPH**, was awarded a Research to Prevent Blindness (RPB) Senior Scientific Investigator Award for $150,000 for his project, "Adenovirus Evolution & Emergence of New Ocular Pathogens." The prestigious RPB award recognizes and supports the work of scientists who hold primary appointments as full Professors and are nationally-recognized leaders in their subspecialty field of scientific eye research.

Dr. Chodosh also received research funding from Janssen Biotech, Inc. in the amount of $31,630 to study, "Infliximab Therapy to Improve Retention of the Boston Keratoprosthesis."

Congratulations to **Reza Dana, MD, MPH, MSc**, the Claes H. Dohlman Professor of Ophthalmology, for being named the 2012 Chancellor's Awardee in Neuroscience and Ophthalmology from Louisiana State University Health Sciences Center School of Medicine. Dr. Dana presented the Chancellor's Award Lecture in Neuroscience and Ophthalmology titled, "From 'Bench to Bedside: Recent Discoveries in the Immunopathogenic Mechanisms of Corneal and Ocular Surface Inflammatory Disorders." He joins a distinguished group of recipients from the past 25 years, which includes 12 Nobel Laureates.

For the third year in a row, an application to support the **Alcon Research Scholar** position has been approved to support the work of a clinical/translational research fellow in the Mass. Eye and Ear Cornea Service. The grant is administered by Dr. Reza Dana.

Juan Ding, PhD, a postdoctoral fellow in the laboratory of David Sullivan, PhD (Schepens), was one of two recipients to be awarded the inaugural 2011 ARVO Foundation for Eye Research/Vistakon Dry Eye Fellowship for basic science research in Meibomian Gland Dysfunction. This newly created program was established in 2011 and will provide annual awards in the amount of $40,000 to two junior investigators in the areas of basic and clinical research.

Michael Gilmore, PhD, the Sir William Osler Professor of Ophthalmology at HMS, received a new research award from Bausch & Lomb in the amount of $157,410 for his project, "Comparative Genomics of Ocular Pathogens."

The Association for Research in Vision and Ophthalmology (ARVO) will be honoring **David G. Hunter, MD, PhD**, Ophthalmologist-in-Chief at Children's Hospital Boston and Professor of Ophthalmology at HMS, with a Distinguished Service Award. The award will be presented during the ARVO 2012 Annual Meeting on May 6. Dr. Hunter is being recognized along with J. Mark Petrash, PhD, FARVO, from the University of Colorado – Denver, and Schepens alumnus, **Shigeru Kinoshita, MD, PhD**, from the Kyoto Prefectural University of Medicine, Japan who was the 2011 Schepens Distinguished Alumnus Lecturer.

Gang Luo, PhD, Assistant Professor at HMS was awarded $40,000 to support his work, "Seeing in Blind Field in Visually Impaired People," from the William F. Milton Fund at Harvard University. These funds aim to facilitate new approaches, initiate new projects, and in particular, assist junior Harvard University faculty members in establishing their research programs.

David Glendenning Cogan Professor of Ophthalmology at HMS, **Richard Masland, PhD**, received a two-year grant from HMS in the amount of $200,000 for his project, "Retinal Ganglion Cells."

HMS Ophthalmology Department chief and chair **Joan W. Miller, MD**, was honored with a "2012 Pinnacle Award for Achievement in the Professions" from the Women's Network of the Greater Boston Chamber of Commerce. The ceremony was held on January 26, 2012 at the Boston Marriot Copley Place. The annual Pinnacle Awards pay tribute to business and professional women who have demonstrated excellence in entrepreneurship, management, lifetime achievement, and a commitment to enhance the quality of life in the region.

Dr. Miller, along with Dr. Eduardo C. Alfonso, Chairman of the Department of Ophthalmology of the University of Miami Miller School of Medicine, were appointed the new Directors of the Heed Ophthalmic Foundation. Dr. Julia Haller, Professor and Chair of the Department of Ophthalmology at Jefferson Medical College of Thomas Jefferson University and Thomas Jefferson University Hospitals, was elected as a Trustee of the Society of Heed Fellows. Since 1945, The Heed Ophthalmic Foundation has provided talented trainees who plan to pursue academic careers in ophthalmology

The 2012 Greater Boston Chamber of Commerce Pinnacle Award recipients (shown clockwise from left): **Joan W. Miller, MD**, Achievement in the Professions; **Carmen M. Ortiz**, Achievement in Management, Government; **Suzanne Bates**, Achievement in Entrepreneurship; **Professor Rosabeth Moss Kanter**, Lifetime Achievement; **Helen G. Drinan**, Excellence in Arts & Education; **Michelle Shell, CFA**, Emerging Executive; **Mary Jo Meisner**, Achievement in Management, Non-Profit; **Marcy L. Reed**, Achievement in Management, Private.

with funding for postgraduate studies in ophthalmology and the ophthalmic sciences. In addition, the foundation sponsors an annual Residents Retreat where selected residents and faculty meet for two half-days to discuss careers in academic ophthalmology.

George Papaliodis, MD, has received a clinical trial agreement award from Santen, Inc. for his project, "Safety and Efficacy of Intravitreal Injections for the Treatment of Active, Non-Infectious Uveitis of the Posterior Segment of the Eye," in the amount of $209,406.

Harvard Medical School student **Mamta Shah** received a Research to Prevent Blindness (RPB) Medical Student Fellowship Award in the amount of $30,000. This one-year grant provides support to an academically gifted student to pursue an eye research project in an RPB grantee department. Ms. Shah will be working under the direction of **Louis Pasquale, MD**, and **Suzanne Freitag, MD**. Their study focuses on the development of an algorithm to independently assess anatomical changes in the eye that are believed to be related to certain types of eye drops used in the treatment of glaucoma.

Lucy Shen, MD, won the American Glaucoma Society's surgical video contest at the society's annual meeting on March 1, 2012 in New York City. Dr. Shen's video showed an endoscopic cyclophotocoagulation on a patient with a Boston Keratoprosthesis Type II implant after a pars plana vitrectomy.

Dr. Shen also received a Young Clinician Scientist Award in the amount of $40,000 from the American Glaucoma Society for her project, "Using Structure-Function Relationship to Aid the Diagnosis and Monitoring of Glaucoma."

Michael Valentino, PhD, an HMS Postdoctoral Fellow at Mass. Eye and Ear and Massachusetts General Hospital, received a fellowship award funded by the National Institutes of Health in the amount of $47,346 for his project titled, "Training Program in the Molecular Eye Diseases."

Demetrios Vavvas, MD, PhD, Assistant Professor of Ophthalmology at HMS, was awarded a Retina Research Foundation Travel Grant to attend the XXXVIII Club Jules Gonin Meeting in Reykjavik, Iceland in June 2012. The meeting is sponsored by the International Council of Ophthalmology.

Staff Updates

Congratulations to the following staff on their HMS appointments or Mass. Eye and Ear promotions:

Sherleen Chen, MD, Mass. Eye and Ear, Assistant Professor of Ophthalmology

James Chodosh, MD, MPH, Mass. Eye and Ear, Professor of Ophthalmology

Dr. Chodosh was also named the David G. Cogan Professor of Ophthalmology in the Field of Cornea and External Disease.

Gabriel Kreiman, PhD, MSc, Department of Ophthalmology and the F.M Kirby Neurobiology Center at Children's Hospital Boston, Associate Professor of Ophthalmology

Shizuo Mukai, MD, Mass. Eye and Ear, Associate Professor of Ophthalmology

Joseph Rizzo III, MD, Mass. Eye and Ear, Professor of Ophthalmology

Dr. Rizzo was also named the David G. Cogan Professor of Ophthalmology in the Field of Neuro-Ophthalmology.

Magali Saint-Geniez, PhD, Schepens Eye Research Institute, Assistant Professor of Ophthalmology

Personnel Changes:

Jason Comander, MD, PhD, now a second year Vitreoretinal Fellow at Mass. Eye and Ear will be joining the Retina and Electroretinography Services in July as a member of the

K12 Harvard-Vision Clinical Scientist Development Program. Dr. Comander received his MD and PhD training at HMS, followed by residency at Mass. Eye and Ear. He was chosen by the Heed Ophthalmic Foundation to participate in their 2009 annual residents retreat. Dr. Comander has a keen interest in retinitis pigmentosa and his research will focus on disease pathology, genetics, and bioinformatics to elucidate the underlying causes of this genetically heterogeneous group of retinal degenerations. He will be working in the Berman-Gund Laboratory for the Study of Retinal Degenerations under the mentorship of Eric Pierce, MD, PhD, and Eliot Berson, MD.

Daniel Esmaili, MD, will be joining Mass. Eye and Ear's Retina Service full-time on July 1, 2012, where he has been working part-time in the Mass. Eye and Ear practices in Stoneham, while maintaining a private practice in Rhode Island. Currently a Clinical Instructor in Ophthalmology at HMS, Dr. Esmaili is involved in resident training, and has also been teaching at Brown University. His research interests focus on retinal imaging, primarily involving optical coherence tomography in age-related macular degeneration. He received his medical degree at the USC Keck School of Medicine and did his residency at the Doheny Eye Institute before training at Mass. Eye and Ear as a Heed Fellow in retina.

Daniel Lefebvre, MD, will become a full-time member of the Ophthalmic Plastic and Reconstructive Surgery Service in July after completing his two-year American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) approved fellowship with service director, Suzanne Freitag, MD. Dr. Lefebvre graduated from SUNY Upstate Medical University in Syracuse, NY and did his residency at Nassau University Medical Center in East Meadow, NY, where he was Chief Resident in Ophthalmology. Dr. Lefebvre has a particular interest in trauma and post-Mohs oculofacial reconstruction.

In early April, **Luk Vandenberghe, PhD**, joined Mass. Eye and Ear as a member of the Ocular Genomics Institute and the Howe and Berman-Gund Laboratories, working in gene therapy research. Dr. Vandenberghe received his PhD in Biomedical Sciences from Katholieke Universiteit Leuven in Belgium in 2008 and trained at three premier gene therapy laboratories at the University of Pennsylvania. Most recently he held the position of Senior Research Investigator in the lab of Dr. Jean Bennett at the F.M. Kirby Center for Molecular Ophthalmology, Scheie Eye Institute at Penn. His new lab will be situated at the Schepens building.

Service

James Chodosh, MD, MPH performed a sight-restoring procedure on a patient from Saskatoon in central Saskatchewan, Canada in December 2011. Dr. Chodosh implanted a Type II KPro artificial cornea in Mr. Ron Buhler, who had lost much of his eyesight from complications of Diptheria. In December, some of his vision was restored with the implanted device. The Province of Saskatchewan paid for Mr. Buhler's procedure and the local Lion's Club assisted with travel expenses for Mr. Buhler and his wife, Olga, to come to Boston for his operation and subsequent follow-up care.

Ilene Gipson, PhD, FARVO, Senior Scientist at Schepens Eye Research Institute and Professor of Ophthalmology at HMS has stepped down after a successful 10-plus year tenure as Chair of Women's Eye Health.org (WEH.org). **Dong Feng Chen, MD, PhD**, Associate Scientist at Schepens and Associate Professor of Ophthalmology at HMS

David Sullivan, PhD, Co-Founder and President of The Tear Film & Ocular Surface Society (TFOS).

was named her successor. Women's Eye Health.org was formed in 2001 in response to the troubling reality that two-thirds of the world's population of blind and visually impaired persons are women. The non-profit, primarily volunteer organization has united with colleagues in the U.S. and abroad to advocate for education, research, and outreach in the fight against blindness and visual impairment.

Roberto Pineda II, MD, appeared on the Arabic television show, "Good Morning Egypt" in mid-February to discuss the sight-saving Boston Keratoprosthesis and corneal diseases. The broadcast appeared in Arabic with simultaneous translation.

Lucia Sobrin, MD, MPH, Assistant Professor of Ophthalmology at HMS, was a featured guest speaker in January for the ArtsEmerson one-woman show, "Sugar," starring Emerson College performing arts professor and internationally acclaimed performance artist Robbie McCauley. "Sugar," examines the struggles and conquests of living with "a little bit of sugar": diabetes. A central theme of the show was to reflect on diabetes from the African American perspective as this disease disproportionately affects people of color. As the featured guest, Dr. Sobrin participated in a "talk back" session along with Ms. McCauley after one of the performances and discussed her promising research on diabetic retinopathy that may one day lead to cures for this disease.

Education Updates

Five faculty members from the Department of Ophthalmology: **Dean Cestari, MD; Ula Jurkunas, MD; Carolyn Kloek, MD; George Papaliodis, MD**; and **Louis Pasquale, MD** were selected to participate in the HMS Leadership Development for Physicians and Scientists course in April 2012. The four-day program focuses on, "institutional organization, finance, legal and regulatory issues, and the full spectrum of communication skills," and is for HMS junior faculty who are responsible for research grants, laboratories, educational courses, or clinical areas.

HMS Assistant Professor of Ophthalmology, **Carolyn Kloek, MD**, was nominated for the prestigious 2011 Charles McCabe Faculty Prize for Excellence in Teaching. Given annually since 1982, this award recognizes "sustained excellence in teaching" at HMS.

In March, **Roberto Pineda II, MD**, and **Sherleen Chen, MD** traveled to Shanghai, China to conduct a course in advanced skills to phacoemulsification cataract surgeons. The "China Alcon Advanced Cataract Course," the first of its kind in Shanghai, was undertaken as part of the department's educational partnership with Shanghai Eye and ENT Hospital.

A report issued by The Tear Film & Ocular Surface Society (TFOS) in March 2011 detailing the conclusions and recommendations of the International Workshop on Meibomian Gland Dysfunction (MGD) was chosen by *Contact Lens Spectrum* as their Event of the Year 2011. The MGD report provided a global consensus on the definition, classification, diagnosis and treatment of the disease, required over two years to complete and involved the efforts of more than 50 leading clinical and basic research experts from around the world. The report was published in a special issue of *Investigative Ophthalmology & Visual Science.* A downloadable version of the document may be obtained at **www.TearFilm.org**. TFOS is led by Co-Founder and President, **David Sullivan, PhD**.

First year Mass. Eye and Ear resident, **Yoshihiro Yonekawa, MD**, was selected as one of four winners of this year's EyeWiki competition for his article, "Pseudophakic Cystoid Macular Edema."

Dr. Yonekawa won an all-expenses-paid trip to the American Academy of Ophthalmology mid-year forum in Washington, DC, in April 2012. EyeWiki is an online "ophthalmic wiki" or eye encyclopedia with content written by eye physicians and surgeons. Check it out at **http://eyewiki.aao.org**.

Congratulations to the following investigators who will be receiving ARVO/AFER Travel Grants for the May 6-10, 2012 ARVO Annual Meeting in Fort Lauderdale, FL:

Concetta F. Alberti, PhD, Research Fellow in Ophthalmology, Schepens Eye Research Institute

Tomas Blanco, Visiting Graduate Student in Ophthalmology, Schepens Eye Research Institute

Sunil K. Chauhan, DVM, PhD, Assistant Professor of Ophthalmology, Schepens Eye Research Institute

Nelly M. Cruz, PhD, Research Fellow in Ophthalmology, Schepens Eye Research Institute

Khayyam Durrani, MD, Clinical Fellow in Ophthalmology, Massachusetts Eye Research and Surgery Institution

Chenying Guo, PhD, Research Fellow in Ophthalmology, Schepens Eye Research Institute

Houman David Hemmati, PhD, MD, Clinical Fellow in Ophthalmology, Mass. Eye and Ear

Jean-Sebastien Joyal, MD, CM, Research Fellow in Ophthalmology, Children's Hospital Boston

Jie Ma, PhD, Research Fellow in Ophthalmology, Schepens Eye Research Institute

Kevin James McHugh, Graduate Student at Boston University, Schepens Eye Research Institute

Thore Schmedt, PhD, Research Fellow in Ophthalmology, Schepens Eye Research Institute

Guadalupe Villarreal, Jr., Graduate Student, Schepens Eye Research Institute

ARVO/AFER Travel Grants provide partial travel support to investigators who have an accepted abstract for the 2012 ARVO Annual Meeting and whose research findings in the abstract are considered to be of high interest to the vision and ophthalmology research community.

Press Time

Kathryn Colby, MD, PhD contributed to *Eyeworld*, The Newsmagazine of the American Society of Cataract & Refractive Surgery's "What's Ahead in 2012" cover-feature article on implantable telescopes for end-stage age-related macular degeneration (AMD). The article also quotes Dr. Colby and references her 2007 manuscript in the *Archives of Ophthalmology,* highlighting the complexity of the insertion procedure and why these devices are only approved for implantation by cornea-trained surgeons.

Dr. Colby also contributed to an article in *Ophthalmology Times eReport* in January that reports on a retrospective study, which shows the Boston Type I keratoprosthesis (Boston KPro, Mass. Eye and Ear Infirmary) is a safe and effective primary method for visual rehabilitation in eyes with corneal blindness not related to autoimmune conditions.

Matthew Gardiner, MD, Director of Emergency Ophthalmology Services at Mass. Eye and Ear made a special appearance on local CBS affiliate Channel 4's 11:00pm newscast on February 7, 2012 as part of a story on how technology impacts physical and emotional health. Dr. Gardiner recounted for reporter, Paula Ebben, how he sees many patients with 'computer vision syndrome', blurring, burning, irritation and trouble focusing caused by lack of blinking when people stare intently at computer screens for long periods of time. Due to a lack of blinking, 'computer vision syndrome' can lead to dry eyes, irritation, and discomfort.

Alumni News

Naval Medical Officer and former Fellow in Oculoplastics, Orbit, Lacrimal and Reconstruction at Mass. Eye and Ear, **Cmdr. Calliope E. Allen, MD**, was awarded the 2012 Building Stronger Female Physician Leaders in the Military Health System (MHS) award, Junior Navy category. Cmdr. Allen deployed to Southern Afghanistan in June 2011 where she is the sole NATO Role 3 ophthalmologist and oculoplastics surgeon in the region.

Class of 2011, Mass. Eye and Ear Cornea Fellow, **John Clements, MD**, moved his family to Benguela, Angola in south-central Africa in September to serve as a medical missionary. He is performing site-restoring cataract surgeries in this desperately impoverished nation where, he said, "of the 20 million people here, more than 60 percent live below the poverty line," and he recently performed the first corneal transplantation ever done in his medical center.

The Schepens Eye Research Institute 2011 Distinguished Alumnus Lecture was presented in October by **Shigeru Kinoshita, MD, PhD, FARVO**, Professor and Chairman of Ophthalmology at Kyoto Prefectural University of Medicine in Kyoto, Japan. Dr. Kinoshita was a member of the Schepens Eye Research Institute in the early 1980s, where, in collaboration with Dr. Richard A. Thoft, he established the concept of centripetal movement of corneal epithelium. Over the past three decades, Dr. Kinoshita's primary interests have been focused on the research and development of new therapeutic modalities for the cornea. Dr. Kinoshita has been highly celebrated for his many achievements and he is currently the Association for Research in Vision and Ophthalmology Vice-President-Elect.

Congratulations to former glaucoma fellow **Joel S. Schuman, MD**, who was recently honored with a prestigious Carnegie Science Award in the Life Sciences award category. Now in its 16th year, the award recognizes and honors individuals and organizations that have "improved lives through their commitment and contributions in science and technology."

A leading authority in the treatment of glaucoma, Dr. Schuman is the Eye and Ear Foundation Professor and Chairman of the Department of Ophthalmology at the University of Pittsburgh and director of the UPMC Eye Center. He is a pioneer in the development and treatment of optical coherence tomography (OCT), a non-invasive technique developed in the early 1990s at Mass. Eye and Ear that is used for early detection and monitoring of numerous ocular conditions, including glaucoma. Dr. Schuman continues to improve OCT technology for managing glaucoma disease in patients.

Dr. Schuman completed his ophthalmology residency at the Medical College of Virginia in Richmond, followed by a two-year clinical fellowship in glaucoma in the Howe Laboratory at Mass. Eye and Ear. He was a member of the HMS faculty from 1990-1991, at which time he was appointed professor and vice chair of the Tufts University School of Medicine. He also served as director of the Glaucoma and Cataract Service at the New England Eye Center.

Congratulations to former glaucoma fellow and HMS Distinguished Alumnus (2010), **Paul Lee, MD, JD**, who was appointed as chair of the University of Michigan Department of Ophthalmology and Visual Sciences and director of the W.K. Kellogg Eye Center, and named the F. Bruce Fralick Professor. In 2010, Dr. Lee established the Dr. Pei-Fei Lee Lectureship in Ophthalmology at Mass. Eye and Ear in honor of his late father who was Mass. Eye and Ear's first glaucoma fellow.

Mass. Eye and Ear Retina fellow class of 2000 alumnus, **Thomas C. Lee, MD**, has been appointed as the division head for The Vision Center at Children's Hospital Los Angeles. Dr. Lee is an associate professor at the Keck School of Medicine of the University of Southern California and is an attending physician at the Doheny Eye Institute.

In Other News

Johns Hopkins Wilmer Eye Institute has joined Mass. Eye and Ear Infirmary and seven other top-ranked ophthalmic academic medical centers nationwide in offering the innovative PROSE treatment (prosthetic replacement of the ocular surface ecosystem) to patients with complex corneal disease. PROSE technology was pioneered by Needham, MA-based Boston Foundation for Sight (BFS), which was founded in 1992 by **Perry Rosenthal, MD**, Assistant Clinical Professor of Ophthalmology at HMS. Today, the non-profit BFS has evolved into a renowned and innovative corneal research, education, and treatment facility. **Deborah Jacobs, MD**, HMS Assistant Clinical Professor of Ophthalmology serves as medical director. BFS is a clinical and teaching partner with Mass. Eye and Ear and the New England College of Optometry and is dedicated to restoring vision and improving quality of life for patients with complex corneal disease through education and outreach, pioneering treatment and patient-focused care.

In Memoriam

Robert J. Herm, MD, a former Mass Eye and Ear Infirmary Resident from 1952-1955 passed away at the age of 84 in December 2011 at his home in Sun City, Bluffton, SC. He is survived by his wife of 51 years, Betsey, their two sons, and four grandchildren. Dr. Herm was an ophthalmologist and former city councilman in Keene, NH, where he practiced for more than 20 years. He served in the U.S. Navy from 1949 to 1952, and went on to establish a private practice in Waltham, MA, during which time he taught at Harvard Medical School. He eventually joined Keene Clinic where he practiced for more than 20 years. Dr. Herm was a co-author of two medical textbooks on refraction and fundamentals of ophthalmology. After retiring from his practice in Keene, Dr. Herm worked for several years as an inspector for the Joint Commission on Hospital Accreditation.

Have a program or course to publicize? **We would be happy to list it in the newsletter. Contact us at eyenews@meei.harvard.edu.**

Andrius Kazlauskas, PhD, continued from page 2

place in little more than a decade. Beyond his early-career discovery of the prevailing principals governing growth factor-induced, intracellular signaling, Dr. Kazlauskas has:

- Identified signaling enzymes that mediate growth factor-dependent proliferation of cells.
- Identified growth factors, receptors and signaling pathways that are both intrinsic to experimental proliferative vitreoretinopathy, and tightly associated with conditions in patients.
- Discovered the intrinsic regression pathway as a novel mechanism for controlling the stability and regression of blood vessels.
- Discovered that diabetic endothelial dysfunction is characterized by the expression of proteins on the cell surface, identification of some of these proteins, and elucidation of how they promote dysfunction.

In addition to his translational successes, Dr. Kazlauskas' basic research activities continue to advance the understanding of signaling pathways. His most recent discovery – that the G1 phase of the cell cycle consists of two growth-factor dependent phases – leaves him uniquely poised to elucidate how signaling pathways are deregulated in ocular pathology.

Dr. Kazlauskas is recognized not only as a first-rate scientist, but as a superb teacher and educator, where he has contributed extensively to the fundamental growth of the department's academic programs and the success of its students. A devoted mentor, Dr. Kazlauskas has trained 25 post-doctoral fellows and six graduate students who have gone on to become independent investigators, assistant professors and postdoctoral fellows. He has served on the Schepens Postdoctoral Trainee Selection Committee, and as director of both the Ocular Gene Therapy Program and the Molecular Biology Core for this program. He has contributed extensively to medical science literature, and has authored more than 120 papers, half as first or senior author, and many of which have been published in leading scientific journals.

Dr. Kazlauskas has received several awards and honors. In 2009, his achievements came "full circle" when he returned to his alma mater, CSU, as an honoree of the University's Distinguished Alumni Award. ■

Ocular Genomics Institute, continued from page 7

to other parts of the body. Also, the eye is an "immune-privileged" site with limited immunological responses so we don't get the same kind of immunological response to gene therapy treatment that we might see if we were applying gene therapy systemically. For these reasons – and because we're having early clinical success – the eye is an arena that holds particular promise for yielding new treatments, such as gene therapy techniques, in the near-term. I also believe that our results may eventually help inform gene therapy investigations on a broader scale that includes systemic diseases.

Has your research directly impacted your clinical practice?

Definitely. We still have a long way to go, but there's a real basis for hope that was not part of the dialogue before. Even though treatments are not yet available for the majority of patients (with inherited retinal degenerations), my conversations with them have changed dramatically. Instead of telling them, 'There's nothing we can do,' I can say, 'We think there will be a therapy for your disease and now is the time to start working towards that goal.' Once we diagnose their disease, we can keep them apprised of potential clinical trials in which they might participate; or, if an FDA-approved drug becomes available, we'll know about it and they'll be able to start therapy. Right now there are multiple trials in progress for at least three different types of retinal disease, and we want patients to be prepared. These opportunities will only grow as gene therapy research continues to expand.

Do you offer genetic testing services to patients now?

Yes, on a research basis. Dr. Wiggs established the department's CLIA-certified diagnostic laboratory in 2005, making genetic testing available to patients with some types of glaucoma and optic neuropathies. The CLIA lab is the perfect launching pad to expand our testing services to other areas of disease. We're now ramping up our clinical capabilities for inherited retinal degenerations and I anticipate that we'll be able to offer affordable, CLIA-certified genetic testing in just a few short months.

As a scientist and physician, what do you find to be the most exciting aspect of the personalized medicine revolution?

Without question, it's the fact that we're living it right now. As an example, last year I saw a 7-year-old patient at Children's Hospital in Philadelphia who was diagnosed with an inherited retinal disorder. At the time, we had no idea what caused his disease and I couldn't offer his parents much hope. Just recently, I saw that same patient here at Mass. Eye and Ear. And this time my conversation with his parents was very different because the genetic testing we've been able to do in the last year identified the specific genetic malfunction that causes this retinal disease. So, instead of a vague discussion about what might be possible, we were able to talk about their son's specific diagnosis and the therapies that are being developed right now that he might be able to receive in a relatively short time. ■

Eyewitness
THE NEWSLETTER OF THE HARVARD MEDICAL SCHOOL
Department of Ophthalmology

243 CHARLES STREET, BOSTON, MA 02114

SAVE THE DATES!

HMS DEPARTMENT OF OPHTHALMOLOGY
Special Events

June 8-10, 2012

Alumni, Annual, Graduation Weekend

Friday, June 8

- **HMS Department of Ophthalmology Annual Meeting**: 7:30am-4:30pm
  Liberty Hotel (Ballroom)
  215 Charles Street, Boston

Saturday, June 9

- **Alumni Reunion Meeting**: 7:00am-3:00pm
  Mass. Eye and Ear Infirmary
  243 Charles Street, Boston
- **Residents and fellows graduation**: 4:00pm
  Meltzer Auditorium

Sunday, June 10

- **Alumni Reunion Special Events**

(details on page 11)

July 20-21, 2012

Annual Mass. Eye and Ear Vitrectomy Course

Course Directors: Dean Eliott, MD, John Loewenstein, MD, and Demetrios Vavvas, MD, PhD

(details on page 12)

September 21-22, 2012

Second Biennial Symposium on AMD

The Starr Center, 185 Cambridge Street, Boston, MA

Committee Co-Chairs: Patricia A. D'Amore, PhD, MBA, Ivana K. Kim, MD, and Joan W. Miller, MD

(details on page 12)