Tracking the Evolution of a Theory

A discovery made in 1923, the year of the school’s inception, still has relevance 100 years later.

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COVER ILLUSTRATION BY HARRY CAMPBELL
This year’s cover illustration represents a phenomenon described by Dr. Austin Roorda in our feature article, where he discusses revelations about how eye movement confers an advantage—through time. “If you get one static look at an object, it’s almost like, ‘Roorda explains. ‘If you get a series of static looks, like when you’re watching a movie, all you get is a time-lapse snapshot through the movie. But if you are moving past the data, you can get a good idea of the house of cards behind it because you’re eyes and brains—have more time and more views, and the information accumulates dynamically."

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Alumnus of the Year

Abraham Bromberg was born in México City in 1947 to parents who were welcomed by México after fleeing Jewish persecution in Ukraine in 1947 to parents who were welcomed by México after fleeing Jewish persecution in Ukraine. Abraham Bromberg was educated in medical science at the Superior School of Medicine at the Autonomous National University of México (UNAM), México’s leading public research university, and has been active in organizing professional optometric associations. He is past president of the College of Optometrists of Mexico-City, and the Mexican Association of Faculties, Schools, Councils (AMFECO). Dr. Bromberg was given the responsibility by Dr. Enrique Graue, President of UNAM, for opening a new school of optometry within the UNAM system in the city of León. This was a significant and important moment for the recognition of optometry in México.

He wrote and proposed the legislative bill that finally made optometry a regulated and licensed profession in México—first at the Chamber of Deputies where it was unanimously approved in 2013, and finally in the Senate where it was also unanimously approved. President Enrique Peña Nieto signed the bill in March 2013. Currently, he is president of the Consejo Optométrico México, a nonprofit organization that is promoting professional optometry in social media as well as continuing education. Thank you, Dr. Bromberg, for making our school shine through your commitment to the profession and to public service!

Year in Numbers

$3,345,472 Total Giving 2023
3,782 Alumni population
662 Total donors
441 Alumni donors
$756,923 Total endowment payout

Professor Bromberg also taught low vision at the Autonomous National University of México (UNAM), México’s leading public research university, and has been active in organizing professional optometric associations. He is past president of the College of Optometrists of Mexico-City, and the Mexican Association of Faculties, Schools, Councils (AMFECO). Dr. Bromberg was given the responsibility by Dr. Enrique Graue, President of UNAM, for opening a new school of optometry within the UNAM system in the city of León. This was a significant and important moment for the recognition of optometry in México.

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Centennial Posters Available!

In celebration of our centennial, we have created a commemorative poster. The poster, created by Bay Area artist Aldo Crusher, is now available to interested alumni and friends. Please contact our alumni office at the email address listed below to request a poster-sized copy for your home or office.

optalam@berkeley.edu

What a year! What a century! Our school has seen remarkable growth, transformation, and countless achievements, all of which have been made possible by the collective talent, dedication and spirit, of our faculty, staff, students, and alumni. Each of you has played an important role in shaping our legacy.

We recently gathered together to celebrate our Centennial Reunion Weekend—our first in-person reunion weekend since 2019. We gathered in the magnificent University Club of our equally magnificent stadium, with whom we share our centennial. Fittingly, the first football victory in Memorial Stadium was in November of 1923—the year of our school’s inception—when Cal beat Stanford. Choo!

We also share our 100-year history with the introduction of the first commercially available insulin, the first issue of TIME magazine, the helicopter, the first diphtheria vaccine, Edwin Hubble’s discovery of galaxies outside of the Milky Way, and 1923’s biggest hit: “Yes, We Have No Bananas.” We should celebrate that the average life expectancy for women in 1943 was 79.5 years, and 78 years for men, but in 2023 is estimated to be 84.2 years for women, and 79.7 years for men. Progress indeed.

The Centennial Reunion Weekend saw us gather together an extraordinary group of optometrists, educators, researchers, leaders and visionaries. Six of the current time alumni who are deans or presidents of North American schools and colleges of optometry, along with two Berkeley deans, joined our community to provide CE on the Saturday, and participate in an unprecedented panel on the Friday afternoon. We discussed their roots, their journeys, their love of the profession and thoughts on its future. The resulting video, modestly titled Visionaries of Berkeley, will be available on our website before the end of the year.

Our Sunday Golden Conference was on the topic of neurodegenerative disease and the eye. For what we believe is the first time, optometry had a Nobel laureate give a COPE approved CE lecture. Dr. Randy Schekman (Physio/Med, 2013), gave a riveting and highly personal account of Parkinson’s disease. Equally outstanding lectures explored the scientific advances in Alzheimer’s disease and glaucoma, communities and differences between neurodegenerative diseases, the role of neuro-inflammation, and clinical presentations informing us of how optometrists can help patients who present with neurodegenerative diseases.

During the day I felt like we were witnessing the future of optometry, as we grow into the role of true primary eye care clinicians, in all of the many ways that the term implies.

Thinking back to the significant discoveries of 1923, it is fascinating to see the progress in vision science over the last 100 years. Indeed, this is a theme of our centennial magazine. In the article “Tracking the Evolution of a Theory,” Professor Austin Roorda considers his own “adulterous” research accomplishments with reference to Berkeley Hall of Fame Frank Weymouth’s seminal article published in 1923 in the American Journal of Physiology titled “Ocular Interests, American Optical Company (who said that research vs industry conflict of interest was a new phenomenon?). Articles included topics such as The Illiterate E Test, Binocular Vision and the Field of View, Problems of Lens Effectivity, Exophoria at Ophthalmoscope (AOSLO) his lab developed to track and record eye movements shows that Weymouth and colleagues’ theoretical proposals were in fact true. This inspired me to look back at the American Journal of Physiological Optics from 1914. The editor was Charles Sherad, the annual subscription was one dollar, and it was published by the Division of Ocular Interests, American Optical Company (who said that research vs industry conflict of interest was a new phenomenon?). Articles included topics such as The Illiterate E Test, Binocular Vision and the Field of View, Problems of Lens Effectivity, Exophoria at Ophthalmoscope (AOSLO) his lab developed to track and record eye movements shows that Weymouth and colleagues’ theoretical proposals were in fact true. This inspired me to look back at the American Journal of Physiological Optics from 1914. The editor was Charles Sherad, the annual subscription was one dollar, and it was published by the Division of Ocular Interests, American Optical Company (who said that research vs industry conflict of interest was a new phenomenon?). Articles included topics such as The Illiterate E Test, Binocular Vision and the Field of View, Problems of Lens Effectivity, Exophoria at Ophthalmoscope (AOSLO) his lab developed to track and record eye movements shows that Weymouth and colleagues’ theoretical proposals were in fact true. This inspired me to look back at the American Journal of Physiological Optics from 1914. The editor was Charles Sherad, the annual subscription was one dollar, and it was published by the Division of Ocular Interests, American Optical Company (who said that research vs industry conflict of interest was a new phenomenon?). Articles included topics such as The Illiterate E Test, Binocular Vision and the Field of View, Problems of Lens Effectivity, Exophoria at Ophthalmoscope (AOSLO) his lab developed to track and record eye movements shows that Weymouth and colleagues’ theoretical proposals were in fact true. This inspired me to look back at...
New Online Continuing Education Catalog

Offering high-quality, live and on-demand courses for optometrists

BY CATHERINE MCCRYSTAL, M.A., M.A.ED

New Online Continuing Education (CE) courses from Berkeley’s expert faculty members. Our goal is to meet their licensure requirements with courses from the California Optometric Practitioner Education (COPE), and make them available to a broad audience—both in-state and national—engaging optometrists in the profession of optometry. All of our asynchronous (streaming on-demand) CE courses are accredited by the Council on Optometric Practitioner Education (COPE), and are self-paced—making them accessible to those who can’t catch a live lecture.

The “Asynchronous Virtual” courses were produced in collaboration with the Herbert School of Optometry & Vision Science’s Office of Virtual Learning and the Herbert School’s faculty expertise on a national—and eventually an international—stage. New courses from our school community will include lectures from Drs. Debora Lee Chen, Sandra Harpster, Maria Liu, Mika Moy, Pam Setiawancharng, Angela Shabazz, Mark Wu, and more! Optometrists in California and across the country will now be able to access CE on-demand whenever they need it, adding to their knowledge of specialty contact lenses, binocular vision, glaucoma, and other ocular diseases.

As part of the school’s investment in online CE, the Office of Virtual Learning and distance learning, the Herbert School of Optometry & Vision Science is leading the field of online continuing education (CE) for the profession of optometry. As part of the school’s investment in online CE, the Office of Virtual Learning is launching a new online CE Course Catalog. The catalog offers a variety of high-quality online courses for optometrists to expand their knowledge and fulfill the requirements of licensure renewal by the California State Board of Optometry. The new online CE Course Catalog will expand the school’s offerings of live online and asynchronous (streaming on-demand) CE courses accredited by the Council on Optometric Practitioner Education (COPE), and make them available to a national audience—engaging more optometrists to meet their licensure requirements with courses from Berkeley’s expert faculty members. Our goal is to provide superior education by leveraging multimedia formats that not only engage the learner, but also provide methods by which education is more accessible. The new streaming on-demand CE courses in the online catalog will continue to uphold the quality of education commensurate with the standards of our school while providing more flexibility for optometrists to meet their licensure requirements.

We are both proud and excited to showcase our faculty expert and to provide methods by which education is more accessible. The new streaming on-demand CE courses in the online catalog will continue to uphold the quality of education commensurate with the standards of our school while providing more flexibility for optometrists to meet their licensure requirements.

The “Asynchronous Virtual” courses were produced by our school staff, including our former educational technology specialist. Heather Dinh, and resident production assistants (Meghan Lau, Phoebe Hyer, and Josefine Tabancay), and me, the School’s instructional designer, with AV support from Matthew Kaminski and guidance from our CE Committee co-chairs, Drs. Pam Setiawancharng and Anne Tsakal. In California, optometrists can complete 20 out of the required 50 hours of CE through asynchronous courses, and some states allow all required CE hours to be completed in this format (make sure to check with your state board!). The courses provide practical, evidence-based, optometric continuing education and are self-paced—you just need to complete a post-course test to earn your CE certificate. The platform is available now at the Berkeley CE portal—just with a few clicks, you can create an account and register for any courses you’d like to take! Once you complete the lecture materials and post-course test, you’ll receive your CE certificate in your email inbox.

We’ll be adding more courses throughout the year and next year, so make sure to check back often! Our CE programs are continually expanding to meet the ever-changing needs of today’s optometrists. We welcome your feedback and suggestions, so please get in touch by emailing our CE Team at optoce@berkeley.edu.

For more information, please visit the Berkeley Continuing Education catalog website.

What is one of your favorite things about the field of optometry in general?
I feel like most people talk about its flexibility, and I do have to agree. You can work part-time, full-time, or multiple jobs in different practice modalities. You can even find opportunities that don’t require you to see patients! I like being involved in realms other than direct patient care and optometry gives me the opportunity to do so.

What advice do you have for students starting to pursue a career after graduation?
Getting a full-time job is very appealing after graduation, but trying different practices and modalities also has its benefits. Four years in school doesn’t give you that exposure, but it is different once you graduate. You’ll realize what you like and don’t like, whether it’s a specific subspecialty, practice modality, or boss. Then, you can add or drop accordingly and you’ll be much happier.

What is the best advice you have received, either as an optometry student or after graduating?
If you have the time and mental capacity, say yes to all opportunities that come your way as a student and at the beginning of your career. Similar to my advice about trying different jobs, you never know where an opportunity will lead and how it may change the trajectory of your career for the better. If you don’t try, you’ll never know.

Tell me more about what research you are conducting.
With part of my time, I help with clinical research in Dr. Maria Luis’s lab. I help with projects here and there— it’s fun to participate in research related to myopia control, and it helps me when I see patients in that clinic. It’s a hot topic and there’s so much more to learn in this particular field.

What do you miss the most about New York City?
I love the energy of New York City and the fact that there is always something to do, no matter your interests. I miss the convenience of everything being so close together and the ability to just hop on the subway. Even though the food in the Bay Area is great, you can’t really find good bagels and pizza here.

What is your favorite thing about working as an attending at Berkeley?
The learning is nonstop, even as an attending I am constantly challenged to learn more and to be a better instructor. It’s fun to work with all the different personalities and to share the knowledge I have picked up along the way.

“Overheard” “What excites me about our new Center in Emeryville is the ability to truly approach children’s vision from an interdisciplinary, collaborative, and seamlessly integrated approach that puts the child first, and optometry and vision care as the ‘integrator.’ We’ll be able to serve children’s vision needs from managing myopia control, pediatric (and adult) concussion and acquired brain injuries, sports vision enhancement, binocular vision disorders, vision related learning challenges, needs of special populations, and more; all within a few footsteps from one another. We’ll be able to serve the patient, their families, and their support networks directly while simultaneously training our next generation of clinicians with this forward-thinking model of healthcare, using the latest technology.”

CATHY M. LEE CHEN, OD, MPH, FAAO
Associate Professor of Clinical Optometry
Chief Mentor, Residency in Vision Therapy and Rehabilitation
Co-Chief, Binocular Vision Clinic

BY ELOISA MORFIN

Fourth year optometry student Eloisa Morfin talks to Dr. Sam Lee, who joined the faculty in 2022 as an assistant clinical professor.

You grew up in California, stayed in California for undergrad, and went to optometry school out of state at the SUNY College of Optometry. How does it feel to be back?
It’s nice to be back in Northern California specifically since my siblings and my parents are all just a short drive away. I’m grateful I was able to live in San Diego for undergrad and New York City for several years and gain that life experience living in such different and great cities.

What do you miss the most about New York City?
I love the energy of New York City and the fact that there is always something to do, no matter your interests. I miss the convenience of everything being so close together and the ability to just hop on the subway. Even though the food in the Bay Area is great, you can’t really find good bagels and pizza here.

What is your favorite thing about working as an attending at Berkeley?
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If you have the time and mental capacity, say yes to all opportunities that come your way as a student and at the beginning of your career.”
Top 10 Medical Drawings of the Eye or Visual Pathway

The Herbert Wertheim School of Optometry & Vision Science turned a glorious one hundred years old this year, but doctors, artists, and philosophers have been drawing, illustrating, and painting eyes and the visual system for centuries in a quest to understand and explain how human vision works. The results can be beautiful, and amazingly accurate—but not always! The following list of images is not a ranking, but is instead a list of favorites submitted by our alumni, faculty, and students.

1. Cells in the Retina of the Eye
   Santiago Ramón y Cajal, 1904
   “Cajal’s drawings of the retina are as beautiful as they are anatomically accurate. Of course, at that time, photography had not matured and renderings were the best way for scientists like Cajal to share their observations.”
   – Austin Roorda, PhD

2. Sagittal and Horizontal Sections of the Human Head
   Leonardo da Vinci, ca. 1490
   “Leonardo had some of the early ideas about how the eye connected to the brain—although they were a little bit off!”
   – Dennis Levi, OD, PhD

3. Visual System
   Greg Dunn, PhD, 2022
   “I particularly like this piece because it is detailed, colorful, and abstract, while representative of how the brain weaves visual data into and out of our attentional networks, emotional and mnemonic systems, and other senses to create our visual experience.”
   – Emily Ward, PhD student

4. Schema Optic System
   Retinogeniculostriate Visual Pathway
   Frank Netter, 1953
   “Very simplified, but so elegant, and a frequent reference check for me during grad school.”
   – Gary Walker, PhD ’98

5. Monkey Visual System
   Felleman & Van Essen, 1991
   “The anatomical hierarchy is the macaque monkey described by Felleman and Van Essen shows the incomprehensible complexity of the visual system.”
   – Gary Walker, PhD ’98

6. Tarsal Plates and Lacrimal System from “The Human Eye”
   Gladys McHugh, 1943
   “The stereographic paintings in this book, a favorite of mine, are amazingly well done and innovative for the time—each image has eight transparencies that can be layered over the illustration to give focus on specific functions of the eye.”
   – John Flanagan, PhD, DSc, FCOptom

7. Theory of Vision, from “Opera Philosophica”
   René Descartes, ca. 1692
   “Descartes argued that we see singly because there is a specialized ‘fusion center’ in the brain that combines the information from the two eyes (although he had it in the pineal gland!).”
   – Dennis Levi, OD, PhD

8. Structure of the Eye and Optic Nerves
   Peter Degravers, ca. 1780
   “I like the way this cutaway image of the eye and optic nerves, which is actually an engraving, reveals a stylized, fantasy-like view of the visual system’s mechanics.”
   – Anonymous

9. Eye Anatomy, from “Astronomiae Pars Optica”
   Johannes Kepler, ca. 1604
   “I like that Kepler shows the anatomy of the eye across different stages of dissection.”
   – Reem Almagati, OD, MS and VS Student

10. Diagram of the Eyes, from the “Book of Optics”
    Ibn al-Haytham, ca. 1200
    “I like the simplicity of the drawing, yet there’s attention to detail like the fibers from the nasal retina crossing to the opposite side of the brain.”
    – Reem Almagati, OD, MS and VS Student
A collection of photographs celebrating 100 years of optometry & vision science have been mounted on the windows on the east side of Minor Hall. As we celebrate 100 years of optometry & vision science at Berkeley, we would like to recognize and thank all the members of our community, who collectively have taken part in the success of our school. The photographs on our building represent a small fraction of the faculty, staff, students, and alumni that, since 1923, have contributed to a century-long legacy of groundbreaking research, clinical excellence, and unparalleled education in optometry and vision science.

Celebrating Our Community

MARLENA CHU, OD
ASSOCIATE CLINICAL PROFESSOR

AHMAD AHMIMZADA
OD STUDENT, CLASS OF 2024

ANGELICA GONZALEZ
ASSISTANT DEAN OF CLINICAL OPERATIONS

CRISTEN ADAMS, OD
ALUMNA, CLASS OF 2016

ORNEIKA FLANDRIN
PHD STUDENT

ELOISA MORFIN & FAMILY
OD STUDENT, CLASS OF 2024

JORGE CUADROS, OD, PHD
ASSISTANT CLINICAL PROFESSOR
Class of 2027

Applicants

342 Applications
224 Interviews
66 Students

Academics

3.20–4.0 Overall GPA range
3.66 Average GPA in Bio, Chem & Physics
3.7 Average GPA in undergrad
350 Average Score on the OAT

Student Profile

20 Out-of-State
45 California
20–38 Age Range
28 Number of students who entered directly from undergrad
37 Number of students who took at least a year off
14 Opto-Camp alumni

Undergraduate Institutions

CALIFORNIA STATE UNIVERSITY - FRESNO
CASE WESTERN RESERVE UNIVERSITY
CHAPMAN UNIVERSITY
CORNELL UNIVERSITY
CONY - HUNTER COLLEGE
GRAND CANYON UNIVERSITY
HARRISBURG UNIVERSITY OF SCIENCE AND TECHNOLOGY
IDAHO STATE UNIVERSITY
KEYMA NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
OREGON STATE UNIVERSITY
PURDUE UNIVERSITY - WEST LAFAYETTE
SAINT MARY'S COLLEGE OF CALIFORNIA
SAN FRANCISCO STATE UNIVERSITY
SAN JOSE STATE UNIVERSITY
SANTA CLARA UNIVERSITY
TUFTS UNIVERSITY
UNIVERSITY OF BRITISH COLUMBIA
UNIVERSITY OF CALGARY
UNIVERSITY OF CALIFORNIA - BERKELEY
UNIVERSITY OF CALIFORNIA - DAVIS
UNIVERSITY OF CALIFORNIA - IRENE
UNIVERSITY OF CALIFORNIA - LOS ANGELES
UNIVERSITY OF CALIFORNIA - MERCED
UNIVERSITY OF CALIFORNIA - SAN DIEGO
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF NORTH CAROLINA - CHAPEL HILL
UNIVERSITY OF SOUTHERN CALIFORNIA
UNIVERSITY OF SOUTHERN CALIFORNIA - ST. PETERSBURG
UNIVERSITY OF SOUTHERN FLORIDA - SARASOTA-MANATEE
UNIVERSITY OF TEXAS - AUSTIN
UNIVERSITY OF VIRGINIA - CHARLOTTESVILLE
UNIVERSITY OF WASHINGTON - BOTHELL CAMPUS/SEATTLE CAMPUS/TACOMA CAMPUS
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
WESTERN ILLINOIS UNIVERSITY
WILFRID LAURIER UNIVERSITY
WILLAMETTE UNIVERSITY

STUDENTS QuickFacts

A look at the class of 2027: who they are, where they come from and how they got here.
Herbert Wertheim School of Optometry and Vision Science professor Austin Roorda, PhD, hadn’t thought much about eye movement until he started making images of retinas. Human eye image quality, he discovered, is “surprisingly poor.” The eye’s optics are fraught with imperfections, casting an upside-down and blurred image on the retina, which is constantly moving. The eye’s three types of cones are arranged in a seemingly haphazard way, and the ~300 million neurons in the retina that process signals from photoreceptors are crammed into a comparatively whisper-thin conduit of axons connecting the eyeball to the brain.

As a person looking out at the world, this isn’t a problem. Our visual system has evolved remarkably to tolerate imperfections and deliver a stable and detailed picture. “The problem is when I try to look into your eye,” says Roorda. The eye’s irregularities and movements result in distortions and limited image quality from standard equipment like a scanning laser opthalmoscope.

So, Roorda set out to design and build better tools to study the earliest stages of the visual process. In the 20 years since, he not only pioneered new technology to see more clearly into the eye, but also into what the eyes are seeing—and, in the process, helped foster an era of discovery at Berkeley.

Pushing Exploration: From Imager to Tracker
Roorda started by taking a cue from the field of astronomical imaging, which had already developed optical technology for ground-based telescopes that corrects for distortions from variables like atmospheric turbulence or temperature fluctuations.

The result? The Adaptive Optics Scanning Laser Ophthalmoscope (AOSLO). Comprised of a thicket of lenses, mirrors, and scanners, along with beam splitters, photomultiplier tubes, and wavefront sensor array, all bolted to a large perforated tabletop, AOSLO’s similarity to an ordinary ophthalmoscope begins and ends with a chin rest (see the photo on the inside of our magazine cover). Roorda credits the “heroic efforts of people in my lab and collaborators over the years” in pushing AOSLO’s capabilities through several rebuilds to its current incarnation. An integrated scanning and video system not only takes images of the retina, but can also be used to deliver images to targeted locations on the retina, while tracking and recording the eye’s incessant motion in real time. AOSLO’s high-resolution microscopy can now peer into a retina down to the level of single cone photoreceptors.

“Improved optical techniques get sharper images. Computer technology has improved real-time calculation of eye movement, and allows us to pin images on the retina in multiple wavelengths,” Roorda says. “We’ve effectively hacked human vision, meaning that we can bypass normal visual processes and control activity in the retina in the ways that the retina or the optics were never designed to do.”

AOSLO has been a wellspring for numerous publications and awards, including a 2015 Audacious Goals...
grant from the National Eye Institute (NEI) for Roorda to lead a retina mapping project in support of an NEI long-term goal: restoring vision by regenerating neurons and neural connections in the visual system that have been lost or damaged.

Roorda’s more recent investigation trajectory into eye movement arose out of a kind of scientific Sisyphus, following curiosity and opportunity. The original idea—for an imagine that removed optical distortions—had to address eye motion, which turned out to yield “a very accurate eye tracker,” says Roorda. And that led to trying to understand the role of eye movement in vision.

The Evolution—and Resolution—Of a Theory
The eyes’ continuous motion of rotating and darting has a long history of both puzzling and inspiring scientists and clinicians. Early on, the conventional—or what some might call the “wisdom”—was that the eyes’ involuntary movements were more akin to a distracting chatter, and a detriment to seeing fine detail.

However, in 1933—the same year that Berkeley’s School of Optometry opened its doors—Frank Weymouth, AM, PhD, FAAO, went against the grain, proposing in an American Journal of Physiology paper, “Visual Perception and the Retinal Mosaic,” that some spatial vision is critically dependent on eye movements. Weymouth (who, after retiring from Stanford University and the Los Angeles College of Optometry, continued his research at Berkeley and is a member of the school’s Hall of Fame) and his colleagues devised two innovative analog experiments to make their case.

First, they had subjects direct tiny offsets along an otherwise straight edge that was projected onto a frosted glass screen through a minutely prepared sheet of aluminum paper to mimic an enlarged array of photoreceptor cones. The researchers simulated a moving eye by shifting the edge behind the perforated paper and a non-moving eye by holding the edge stationary. The ability to detect the minute offset was many times improved when the edge was moving. In a second experiment, they removed the perforated screen and had subjects detect the minute offsets in the straight edge directly, this time controlling retinal motion by either briefly flashing the light of the edge or allowing subjects up to seven seconds of continuous viewing. Just like before, eye movement was shown to confer an improvement in performance.

The initially controversial theory gained acceptance over the decades, but it remained just that—controversial. Until AOSLO.

In 2009, Roorda and Chung worked with the Berkeley School of Optometry and Vision Science professor Dennis M. Levi, OD, PhD. “But we’re learning from Dr. Roorda and others that normal eye movements have a purpose—to see fine detail and contrast, to get the eye where it needs to go.”

So, with the goal of improving clinical treatment options, Levi and colleague Susana Chung, OD, PhD, are pursuing the answer to a “chicken vs. egg” question: Does amblyopia cause abnormal eye movements? Or are the abnormal eye movements causing amblyopia?

Using adaptive optics built by the Roorda Lab, Levi and Chung are measuring study participants’ responses to visual cues in rapid succession—on the order of 100ths of a second. “We can reverse engineer what’s going on,” Levi says. “We can see what’s going on in the brain and in the eye.”

Using the data they collected, Levi and Chung developed technology that allows us to revisit long-standing questions that led to trying to understand the role of eye movement in vision.

The findings, published in the Journal of Vision in 2017, showed that the human visual system has evolved not only to tolerate the eyes’ incessant movements, but also to leverage this motion, which improves acuity about 25%. “When we allowed eye movements, the letters became clearer—people could see it and which direction it faced more consistently,” Roorda says.

AOSLO’s high-contrast tracking capabilities provided further revelations about how eye movement confers an advantage—through time. “If you get one static look at an object, it’s hard to see,” Roorda explains. “If you’re still standing and looking through a slated fence, for example, all you get is a little glimmer through the openings. But if you are moving past the slats, you can get a good idea of the house or the garden because your eyes—brain have more time and more views, and the information accumulates dynamically.” (See our magazine cover for an illustration of this phenomenon.)

AOSLO is also getting researchers closer to tracking the neural processing circuitry that underlies the benefit of eye movement. In a 2020 Journal of Vision paper, Berkeley computational neuroscientist Bruno Olshausen, PhD, and his student, Alex Anderson (Physics PhD), used the device’s tracking data to show that simultaneously observing object shape and eye movement, neurons in the visual cortex can discover a higher-quality representation of an object by averaging out non-uniformities—not unlike the computational imaging principles for achieving “super-resolution” via camera motion.

From Bench to Clinical Care
Berkeley has become an informal hub of eye-tracking expertise with six different labs at the Herbert Wurster School of Optometry & Vision Science currently involved with clinical eye movement research. Several of those investigators either use AOSLO data or devices built for them by the Roorda lab, which has also nurtured innovative technology for direct patient care (see sidebar).

“There’s a growing interest in trying to understand these processes for dynamic vision,” says Roorda, whose lab continues to advance basic science with AOSLO, while connecting the dots at every opportunity to clinical applications. The Roorda Lab is at the forefront of changing the way we view the inner workings of the brain.

AOSLO offers clinicians objective measurements of visual function—a necessary component of leveraging emerging treatments that can slow the progression of degenerative diseases, says Roorda. In their 2020 paper, the researchers reported that patients with retinal degeneration can lose 50% of their cones before they present with a significant drop in their visual acuity.

“Thats shows that eye movements and motion can help mitigate the impact of cone loss. It’s also a warning message to doctors that you can’t rely on visual acuity tests to determine the level of cone loss due to retinal diseases,” Roorda says. “With AOSLO we can ask questions like ‘What is the function of that last cone at the edge of the lesion in this patient with a degenerative disease?’

“Microscopic images of the living human eye offer cellular level insights into how eye disease is manifest, how it slows its progression, and how it responds to treatment,” he adds. “This allows us to study human vision in health and disease in an unprecedented way.”

Innovation: Measuring Eye Movement for Better Health
With a background in optical engineering, Christy Sheehy, PhD, wanted to use her hands and “build something” for her graduate work at Berkeley. Roorda suggested a high-resolution imaging device that—until the rest of the lab’s projects—would not use adaptive optics.

The result? A promising prototype with the potential to evaluate eye and brain health, a UCSF post-doctoral fellowship focused on clinical applications for multiple sclerosis (MS), and a start-up company that recently received FDA clearance for Sheehy’s pioneering retinal eye movement monitor.

Neuropsychological diseases—like MS, Alzheimer’s, Parkinson’s, Huntington’s—as well as brain injuries, retinal disease, psychiatric disorders, and even cardiac health can be examined “through the window of the eyes,” says Sheehy, chief executive officer and co-founder of C. Light Technologies. “The company’s Retracker™ tabletop eye movement monitor records retrospective, non-invasive retinal video scans that measure microsaccadic and saccadic eye movement at the microlevel.

“Depending on the condition and the area of the brain, eye movement can be affected in a unique way,” she says. “During my postdoc working at MS, we saw a lot of pattern changes, like nystagmus—uncontrolled, repetitive motion—or square-wave jerk eruptions: Sheehy’s recent research on concentrations showed microsaccades—small, jerk-like, involuntary eye movements—that are bigger and faster than age-matched controls.

Currently cleared as a general eye movement monitor with subsequent clinical validation, the Retracker™ is in use by clinicians at UCSF, the Miami Health System, and the Medical College of Wisconsin. Sheehy sees a bright future for the technology, and is aiming for FDA clearance for the device to detect specific neurological indications. The company is also building algorithms to develop future AI capabilities for early detection and prognostication in health care.

Applying her research to clinical care has a personal element for Sheehy, who lost an aunt to early onset Alzheimer’s, a grandmother to later stage Alzheimer’s, and has an immediate family member with mild cognitive impairment.

“Being able to use the output of the eye as an early indicator or biomarker is huge. Neurology is decades behind in terms of monitoring, early detection and walking speed for assessments,” the says. “I would love to help change neurology from a reactionary space of medicine to one that’s more preventative, objective, and forward thinking.”
Dr. Jorge Otero-Millan sits in a gaming pod that has been repurposed for investigations into how we perceive the world while we move.

Inside the Lab of Dr. Jorge Otero-Millan

BY ZAC UNGER

Dr. Jorge Otero-Millan's lab feels like a cross between a video arcade and an underground goth night club. Everything from the walls to the door handles is painted pitch black, there's not a window to be found, and screens of various sizes are placed in front of mysterious contraptions. The centerpiece of it all is a race car simulator, complete with captain’s chair, steering wheel, and three flat-screen televisions, all atop a base that can move a seatbelted “driver” in any direction. “I have this here just for the ‘oh, wow factor,’” Otero-Millan jokes. And while it’s understandably true that not every professor at the Herbert Wertheim School of Optometry & Vision Science gets their own personal carnival ride, Otero-Millan’s devices are actually critical tools that have great promise for the study and treatment of multiple maladies, from post-concussion syndrome to Parkinson’s disease.

We often talk about “staring intently” or “fixing our gaze” when we want to indicate that somebody is trying to get a good look at an object. But our eyes are anything but static while they work to make sense of the world around us. “Our eyes are not perfect,” Otero-Millan explains, “only a little bit of our eyes see with high resolution, and if things move too fast in front of us we just see a blur.” At the center of the retina is a small area of densely packed photoreceptors known as the fovea; this area provides us with our sharpest and most acute vision. In order to send coherent images to the brain, the eye tries to keep the fovea stabilized and directed at the area of our main interest, Otero-Millan says. “But it also brings problems. Because as we have to look around, important images are jumping around in our retina,” which would make it hard to walk in a straight line if the path in front of us appears to be in constant motion.

Different animals have developed different solutions to this problem. If you hold a chicken and rotate its body, for example, the bird’s head will stay in one place so that the eyes can remain locked on target. Human beings evolved a different strategy, using smooth involuntary eye motions that keep the fovea directed at the area of interest, even as our heads—and the things we’re looking at—are in constant motion. Whenever we want to change the
The eyes are like an EKG for the brain.

“Life without eye movements would make completing simple tasks, like preparing food or navigating from one place to another, devastatingly difficult,” says Stephanie Bean-Miller, one of Otero-Millan’s lab. Without eye movements, the visual input to our brains would be unstable and shaky due to our constant head and body movements. Without eye movements, we would probably experience neck pain because we’d be moving our heads rapidly to place the fovea on areas of interest, we use rapid motions, called saccades, to measure very precisely.” Eyes can only move in three directions: up, down, and side-to-side. Instead, these are staccato motions: “It’s a jump and a stop,” Otero-Millan says. “If you try following your eye movements, you’ll see that everything is stable in front of us, while in reality the retina is constantly in motion.”

These saccadic motions happen constantly, often as many as three to five times per second. These are different from slow, voluntary eye movements, such as when a doctor asks you to follow her finger as she moves it back and forth, then around in an arc, and each of those jumps is a saccade. Even if you are trying to stare directly at a point, your eyes are going to be making the very small saccades that you can’t even notice. It’s the brain’s job, then, to take this scattered, disjuncted information and assemble the discrete pictures into the smooth coherent movie that is how we experience our world. As an exercise, Otero-Millan has his students stand in front of a mirror, and asks them, “Focus on your left eye and then focus on your right eye, back and forth, and what kind of motion do you see?” If you try this at home you’ll notice nothing. Your brain does such a good job of putting it all together that you won’t be able to detect any motion whatsoever. But look into the eyes of somebody else doing the exact same thing, and the eye motion will be immediately obvious.

Chen continues, “I want to create a full model of how the brain interprets motion, how we perceive things as being stable or not.” While the clinical application of using saccades to diagnose pathology is still in its infancy, there appears to be great promise. Alzheimer’s disease, stroke, epilepsy, dementia, and traumatic brain injury are just a few of the conditions that Otero-Millan and his colleagues hope to better understand through their work. “The great thing about eye movements,” he says, “is that they’re easy to measure very precisely. Eyes can only move in three ways: up, down, side-to-side, and up and down — a particular interest of Otero-Millan’s — where the eyes rotate around the central axis, the way you would turn a volume knob on an old-school radio. A person’s arm, by contrast, has many more degrees of freedom along which it can travel, so measuring movements there is messy and imprecise. “The other advantage,” according to Otero-Millan, “is that the eye is directly connected to the brain through fewer neurons than other muscles. Additionally, different types of eye movement are associated with particular and well-differentiated locations in the brain. For example, Otero-Millan explains, “If we lose local lesions in the brain, you may actually get eye movements and saccades that are completely normal when it comes to smooth fixation, but the eye can’t stabilize when the head turns or moves up and down.” The eyes, therefore, can manifest problems in very specific brain localizes, pointing clinicians towards a diagnosis. “Instead of having to ask a patient whether they can see my finger or if a light was moving to the right or left,” Otero-Millan says, “I can introduce a measurable stimulus, track exactly how the eyes respond, and know how the brain is processing.”

Chen says, “I’m developing software that can be downloaded as an app, or be incorporated into devices that track eye motion. Other devices are similar to what you might see in an ophthalmologist’s office, designed to minimize head motion while the clinicians — or in this case, eye-tracking software — analyzes the patient. But the most effective device in Otero-Millan’s arsenal may be one that most people already spend hours a day staring into our smartphones. “This is in its infancy,” Otero-Millan says, “but I think it’s about to explode. The devices people have at their homes are going to be able to measure eye movements with more and more accuracy.”

“All the devices in Otero-Millan’s lab are designed to measure eye motion in various ways. The near eye simulator allows a subject to be bounced around while wearing special goggles outfitted with inward-pointing cameras that track eye motion. Other devices are similar to what you might see in an ophthalmologist’s office, designed to minimize head motion while the clinicians analyze the patient. The most effective device in Otero-Millan’s arsenal may be one that most people already spend hours a day staring into our smartphones. “This is in its infancy,” Otero-Millan says, “but I think it’s about to explode. The devices people have at their homes are going to be able to measure eye movements with more and more accuracy.”

The science of eye tracking is of particular interest to tech companies, who not only want to know precisely where users are focusing their attention, but also need to interpret how saccades work in order to make virtual-reality successful. “If you want to understand why those virtual reality headsets make people nauseous,” Otero-Millan says, “you need to understand how the brain interprets motion, how we perceive things as being stable or not.”

Despite the commercial potential for his work, Otero-Millan remains committed to the clinical applications and the potential for making life easier for those suffering from diseases. “He doesn’t come from a clinical background,” says Chen, “and yet he has such a clinical eye, combined with a vast point of view and a multidisciplinary perspective that will eventually be so valuable to our patients.”

As for Otero-Millan himself, his dreams are even more expansive. “I want to create a full model of how the brain controls our eye movements,” he says. “How does the brain know if the eye has moved or the world has moved? Once we have that model, we can change any little piece of it and truly understand what our patients are experiencing. That model will be the ultimate diagnostic tool.”
BY GORDY SLACK

Dr. Emily Gorski and the Vision Functions Clinic solve diagnostic mysteries

The Vision Functions Clinic (VFC) is no noir, says Gorski. “We’re crackling with life and open, modern, and clean. Smoking is verboten.” Nonetheless, Emily Gorski, OD, the clinic’s chief, does see her mission as something like that of a private-eye, bringing both investigative technologies and her own determination and deductive powers to bear on difficult-to-diagnose cases of failing vision.

When vision works, it seems so simple: the world is just there for us to see. But when it fails, vision’s complexity becomes acutely apparent. While a general practitioner or optometrist can check many potential explanations for vision problems by simply examining the eye, if the cause isn’t visible, a deeper level of inquiry may be necessary. So Gorski, an assistant clinical professor of optometry, deploys electrophysiology to track down elusive diagnoses at Berkeley’s Vision Functions Clinic. Most of her patients have been referred by primary eye care providers unable to identify the nature of their patients’ blurred vision, night vision problems, or excessive light sensitivity.

“Locating the nature of the problem can validate the patient’s experience, even if the condition cannot be fixed.”

Formed nearly three decades ago, the VFC is specially equipped to interrogate the functioning of the retina and the optic nerve, and hence to identify various retinal and visual pathway disorders. The clinic’s two gravitational centers are, first, an electro-oculogram (EOG), a machine used to measure the electrical activity of the retina in response to light stimulation, and second, Gorski herself, who took over as clinic chief in 2019. She is trained specifically to use the EOG and the clinic’s other extra-sensitive testing devices, and to interpret their results. By locating and reading electrical signals emitted from groups of cells firing in the retina, the EOG enables clinicians to evaluate patients for retina-related conditions and to reliably monitor retinal function over time, helping to evaluate the efficacy of—and to fine-tune—retinal treatments. “The EOG shows objectively how the retina is functioning so we can figure out what’s really going on at the cellular level in the most puzzling cases,” Gorski says.

To reveal the diagnosis, which might include additional labs for systemic diseases, MRIs of the brain, or genetic testing. For example, if an inherited retinal dystrophy is suspected, we will recommend genetic testing, and the EOG will provide context for interpreting the results and giving us a better idea of prognosis.

Visually Evoked Potential (VEP) Null results from retinal tests suggests the problem may lie further downstream in the visual system, and Gorski can follow such leads with a Visually Evoked Potential (VEP) test, which assesses the conduction of visual signals from the retina through the optic nerve and to the various visual processing areas of the brain. The patient taking the VEP has their scalp fitted with electrodes and is presented with visual stimuli, such as patterns or flashing lights, while the electrodes pick up the electrical signals traveling through the optic nerve to the visual cortex in the back of the brain. Gorski analyzes the speed and strength of the signal conduction to glean more valuable clues about the functioning of the optic nerve. If she identifies a problem there, she is likely to refer her patient to a neuro-opthalmologist or a neuro-ophthalmologist.

Helping patients navigate the best way forward Many more than not, Gorski is delivering tough news to her patients and their doctors. If they have made their way to her clinic without a diagnosis, their conditions are likely to be systemic and degenerative. Retinal dystrophies are the most common conditions her detective work reveals. Case-studies are not uncommon. Stargardt disease is another condition that she too often sees. These diseases may not be curable, but accurate diagnosis is key to ensuring patients can understand the best available treatments or adopt the best mitigations to maintain their quality of life. What’s more, when a patient experiences a symptom, say very poor night vision, but can’t find an explanation, that can be very demoralizing. “Locating the nature of the problem can validate the patient’s experience,” says Gorski, “even if the condition cannot be fixed.”

“Although many of these retinal issues don’t have treatments or cures, often, we can still help by getting the patients the rehabilitation or just the prognosis that they need,” says Gorski.

Sometimes a clinic visit does reveal information that helps a patient recover lost vision or avoid further harm. For example, Gorski sees cases of retinal inflammation, where early diagnosis helps avoid permanent damage, and treatments such as intravitreal injections or systemic medications may help improve the problem. She also tests patients taking medications for unrelated conditions that may cause retinal damage. “We’re able to monitor these patients closely so that if they develop a toxicity, we can end the medication course before they even have visual symptoms of it. We’re able to save them from a sight-thrashing condition. That’s very gratifying.”

In some cases, Dr. Gorski refers patients with intractable retinal or optic nerve conditions to clinical trials, which may help those patients as well as advancing knowledge in the field. She has high hopes for, for example, emerging gene therapies that become available to her patients, many of the inherited retinal dystrophies she now diagnoses will become treatable. “With treatment options for these conditions, early diagnosis with EOG testing will be all the more critical,” she says. And more of the tough and hard-to-crack cases she investigates will have a clearer resolution.
LOOKING BACK

Aubrey Vetrone, OD,
Class of 2020

Where are you living now? Sacramento, CA

What are you doing now for work? After graduating in May of 2020, my husband (Vincent), first born son (Kayden), and welcomed our first baby girl (Hylia) into our family in June of 2020. I enjoyed 6 months with her and began working part time in November of 2020. I started my career as an optometrist at a busy private practice in Elk Grove, CA, called Crystal View Optometry. After being there for a while, I decided I wanted to experience working in different types of private practice settings. So I started some fill-in-work both in a private practice located within a Target, and the small private practice that helped kickstart my optometry journey, called Wang Optometry. I began working full time at Crystal View Optometry in the beginning of 2022 and occasionally filled in, when needed, with Wang Optometry. However, with another baby girl on the way, I am entering maternity leave, but when I return I will continue to work with both offices.

What is the web address for where you work? crystalviewoptometry.com

What bit of advice or wisdom would you have for students just starting their OD Program? My biggest piece of advice for any and all Opto students is to take it one day at a time! Optometry school throw a LOT at you—whether it’s educationally, socially, mentally, etc. The education program is tough, but I have been using the clinical information from the moment I stepped foot in the clinic for rotations. The social experiences such as attending some of the different events the school put on allowed me to get to know my professors, classmates, and other Optos not in my cohort/class (such as my stab family) even better than I would have by simply attending classes. Additionally, it was a huge bonus that my classmates and I became a family and were supportive of one another from day one. It’s not an easy journey by any means, but I will say it’s worth it! I love my career and appreciate all the experiences I had while at Be!

Katherine Makedonsky, OD,
Class of 2017

Where are you living now? San Carlos, CA

What are you doing now for work? I work for Verily, a Google created start-up. I’m the clinical lead on a retinal camera intended to be used by primary care physicians. The goal is to conduct a retinal screen for people who have diabetes or ophthalmologist if pathology is identified. I work with software engineers, hardware engineers, user experience designers and product managers to ensure that our product operates successfully while ensuring a seamless usability. I like that every day at work is different, and that I get to experience all the Google offices and their perks! One day a week I still do see patients at a private practice in Los Altos. This keeps me current and connected.

What is the web address for where you work? verily.com

What bit of advice or wisdom would you have for students just starting their OD Program? Patient care is extremely rewarding. I recommend approaching the optometry program with excitement because you love the patients. Working in industry is very niche, and may be worth exploring after approaching the optometry program with excitement because you love the patient care. Working in industry is very niche, and may be worth exploring after.

Laura Carter, OD, MPH,
Class of 2022

Where are you living now? Richmond, CA

What are you doing now for work? I see patients full time and I love it! I am one of three optometrists at a new eye clinic started last year at the Petaluma Health Center, and I’m so lucky to be here. It’s a National Health Service Corps site in Sonoma County that serves primarily Medi-Cal covered and uninsured patients. The clinic is nationally recognized for being an excellent place to work and the staff I work with are absolutely amazing. I also get to really practice my Spanish everyday.

What is the web address for where you work? phchealthcare.org

What bit of advice or wisdom would you have for students just starting their OD program? Find balance in your study habits early on. Have at least one fun activity planned every week that you can look forward to throughout the semesters. Something to keep your motivation and spirits high when the program gets tough, which it definitely will. Aim not for perfection but for perseverance and well-roundedness. And keep a good sense of humor.

Vasha DuTell, PhD,
Class of 2022

Where are you living now? Cambridge, MA

What are you doing now for work? I did my thesis work with Bruno Olshausen and Marty Banks building a head-mounted eye tracking system to study the statistics of human vision in the wild. I’m currently doing a postdoc at MIT CSAIL, as an inaugural fellow in the METEOR Fellowship program. I’m co-advised by Ruth Rosenholtz and Bill Freeman, working at the intersection of human vision and computer vision, where we are using machine learning to improve current models of peripheral vision. This summer, I’m participating in MIT’s delta v accelerator program founding a startup in mental health/wellness and AI.

What is the web address for where you work? csail.mit.edu

What bit of advice or wisdom would you have for students just starting their Vision Science PhD program? My advice for students just starting their PhD is: 1) Make sure you absolutely LOVE whatever project you are working on—you’ll need that passion to get through the long journey to graduation; 2) Everyone (yes even the professors) experience imposter syndrome—always remember that you do belong here; and 3) Take your physical and mental health seriously, even if you are optimizing for productivity alone; taking care of these basic needs is always worth the investment.

Our recent grads are out in the real world making a big impact. See where they ended up.
John, Chris and Monica talk about their vision for the school’s future as the Herbert Wertheim School of Optometry & Vision Science embarks on a second century of excellence.

**What is your vision for the school?**

**John Flanagan:** Our ambition is to lead the profession. To make this happen, we are embarking on an ambitious and unprecedented period of growth. Our vision includes a new satellite campus in Emeryville that will offer optometry-led, interdisciplinary children’s eye care and vision health; the Academy for Advanced Optometric Education, an expansion of our residency program; establishing clinics at other UC schools; creating new teaching spaces that will feature clinical skills labs where students can practice basic as well as advanced techniques; a clinical trials research center; and increasing the number of fellowships for PhD students in the Vision Science Graduate Program.

**Why did the school choose Emeryville for a new clinic?**

**Monica Porter:** The Emeryville site was donated to the UC Berkeley campus—an estimated $17M value. The campus will provide use of the space rent-free for the life of the building. Space constraints at our current clinics have hindered our ability to expand high-revenue clinics; such as Sports Vision Therapy and Rehabilitation and Myopia Control, and expansion of our professional continuing education programs. The Emeryville site’s 134,000 square feet will allow the expansion of these clinics and programs to include an exam lanes, therapy rooms for sports vision and BV, a retail eyewear center, and an academic center for continuing education.

**How is the Emeryville project being funded?**

**Monica Porter:** The funding for this project is coming from a variety of sources. A generous seed gift of $3m from the Wertheim Family Foundation—part of the $8m donation from the Wertheims—and the $17m in-kind gift from the campus, described above, as well as $2m commitment from the school as part of the ongoing “Our Future, Our Vision” campaign, form the bulk of the project’s funding.

**When will the new Emeryville clinic open?**

**Monica Porter:** We expect the new clinic to open in late 2024.

**What services will be offered at the new Emeryville clinic?**

**Chris Wilmer:** The new Emeryville clinic will double our clinical capacity, expand opportunities for world-class education and research, and advance an exciting new model for integrated pediatric optometric care.

**“The new Emeryville clinic will double our clinical capacity, expand opportunities for world-class education and research, and advance an exciting new model for integrated pediatric optometric care.”**

**Chris Wilmer**

**How will the new clinic benefit the community?**

**Chris Wilmer:** Our mission has always been to care for the community. The emphasis on pediatric vision care will provide access to expert eye care from top-notch doctors, residents and interns, for our youngest patients and their families. Our goal is to be welcomed by the Bay Area community to our newest clinic, and look forward to delivering the kind of world-class primary and specialty vision care that can improve the visual and functional lives of our patients.

**How will the new Emeryville clinic benefit students?**

**Chris Wilmer:** We are proud of the opportunities and training that our students are currently receiving—our faculty are best-in-class, and students are exposed to specialty clinics that provide a vast array of unique, cutting edge optometric care. However, we are limited by our existing physical space. The Emeryville clinic will provide students increased exposure and training for pediatric eye care and vision health, as in areas related to binocular vision, sports vision, neuro rehabilitation, myopia control, and low vision. Our hope is that these increased opportunities will provide a richer experience for our students.

**How will the new clinic support the profession?**

**John Flanagan:** The new clinic in Emeryville will include a center for professional education that we are calling the Academy of Advanced Optometric Education. We’ll use this space to host continuing education events, lectures, and seminars that are designed to be hands-on, and workshop-based small group learning. Our goal is to provide a dynamic learning environment for optometrists to enhance their skills and stay at the forefront of their profession.

**Will the Emeryville project adhere to sustainability best practices?**

**Monica Porter:** Yes, we are introducing two new modules for our 200 series—our clinical lab courses—for the 2023-24 academic year. The new modules concentrate on in-office laser and minor surgical procedures. We will also be offering a new course called Health Economics, Law, and Policy (DELP), which is an introduction to the health care system and the challenges we currently face as a nation in providing affordable, accessible, and high-quality care to patients. Several outstanding guest speakers with expertise in public health, health policy, sustainable community health, infectious disease, DEIB, and artificial intelligence will participate to share perspectives and ideas that will guide our next generation of health care providers.

**What is your vision for the future of our residency training program?**

**Chris Wilmer:** We would like to expand our residency training program. Residency training is important in a number of ways. It’s a great way to develop expert doctors, trained in specialties such as pediatrics, myopia control, or sports vision—just to name a few—who canslots into a community practice or join our faculty here at the school. In this way, it’s a huge benefit to the profession, and it’s important that we contribute to that. Residents also play an important role in serving our patient’s needs here at our own clinics. But expansion needs to be done carefully. We need to ensure that it’s sustainable and that we are providing a rich experience for our residents. As the Emeryville clinic comes online, we anticipate that we will be able to leverage the increased space to add more residents in the specialties area. We also can imagine placing residents at other UC schools as a way of expanding our off-campus residency opportunities.

**Is it true that the school plans to move to a satisfactory/un satisfactory grading system?**

**John Flanagan:** Yes, we are very excited about this change! We have received permission from UC Berkeley’s Academic Senate to become the first optometry program in North America to move to a satisfactory/unsatisfactory grading system throughout the entire curriculum. This is common in medical schools, but has not previously been offered in optometry programs other than in some clinical courses. We think this change will be a significant benefit to our students. An important development in professional health science education has been to try and de-emphasize the competition within a cohort. Replacing the competition for grades will allow students, we believe, to learn to be professional colleagues as part of their education, to respect each other’s unique gifts and abilities, and will put more of an emphasis on what each individual needs to learn to become the best optometrist they can be. It’s too bad that our current grading system isn’t intended to reduce the hard work and intensity of focus required for becoming a good doctor, but we want to eliminate the feeling that you need to be competitive with your peers to get there. This will be introduced in the fall of 2023 to the first year class, so will be fully operational across all classes by 2024.

**Will any new courses be added?**

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**John Flanagan:** Yes, we are very excited about this change! We have received permission from UC Berkeley’s Academic Senate to become the first optometry program in North America to move to a satisfactory/unsatisfactory grading system throughout the entire curriculum. This is common in medical schools, but has not previously been offered in optometry programs other than in some clinical courses. We think this change will be a significant benefit to our students. An important development in professional health science education has been to try and de-emphasize the competition within a cohort. Replacing the competition for grades will allow students, we believe, to learn to be professional colleagues as part of their education, to respect each other’s unique gifts and abilities, and will put more of an emphasis on what each individual needs to learn to become the best optometrist they can be. It’s too bad that our current grading system isn’t intended to reduce the hard work and intensity of focus required for becoming a good doctor, but we want to eliminate the feeling that you need to be competitive with your peers to get there. This will be introduced in the fall of 2023 to the first year class, so will be fully operational across all classes by 2024.

**Will any new courses be added?**

**Chris Wilmer:** Yes, we are introducing two new courses for our 200 series—our clinical lab courses—for the 2023-24 academic year. The new modules concentrate on in-office laser and minor surgical procedures. We will also be offering a new course called Health Economics, Law, and Policy (DELP), which is an introduction to the health care system and the challenges we currently face as a nation in providing affordable, accessible, and high-quality care to patients. Several outstanding guest speakers with expertise in public health, health policy, sustainable community health, infectious disease, DEIB, and artificial intelligence will participate to share perspectives and ideas that will guide our next generation of health care providers.

**What is your vision for the future of your residency training program?**

**Chris Wilmer:** We would like to expand our residency training program. Residency training is important in a number of ways. It’s a great way to develop expert doctors, trained in specialties such as pediatrics, myopia control, or sports vision—just to name a few—who can slots into a community practice or join our faculty here at the school. In this way, it’s a huge benefit to the profession, and it’s important that we contribute to that. Residents also play an important role in serving our patient’s needs here at our own clinics. But expansion needs to be done carefully. We need to ensure that it’s sustainable and that we are providing a rich experience for our residents. As the Emeryville clinic comes online, we anticipate that we will be able to leverage the increased space to add more residents in the specialties area. We also can imagine placing residents at other UC schools as a way of expanding our off-campus residency opportunities.
1960

1 | Lee Goldstein, OD ’66
Dr. Goldstein drove the length of Baja California from Mexicali to La Paz and back; touched whales in San Ignacio Lagoon; led an off-road group through the Great Basin in Nevada; traveled to Scotland; and chaired Earth Day in Laguna Woods!

1970

2 | Michael Clark, OD ’73
Having always enjoyed the great hiking available in California, early this summer, Dr. Clark decided, along with a close childhood friend, to explore the verdant pastoral landscape of Western Ireland. The pair decided to hike the lesser known and more manageable Kerry Way in southwestern Ireland. The 140 mile 8 day hike spans some of the most rugged terrain of this small island nation. Like California, it also offers some of the most spectacular interfaces of land and sea.

3 | Larry Thal, OD ’75
In 2023 Thal Vineyards won a gold medal, two silver medals and a bronze medal in the California State Fair! The vineyard, started by alum Larry Thal and his wife Esther, was created in 2010 as a solution to a worsening erosion problem on the steeper slopes around the Thal home on 14 acres in Lafayette. Due to grape vines having strong and deep roots, their tolerance for minimal irrigation and their resistance to fire, this seemed like a perfect solution. Larry and Esther’s appreciation of good wines led them to UC Davis for assistance in analysis of soils and climate and to the eventual decision to plant Cabernet Sauvignon, Merlot and Sauvignon Blanc. Together with local winemakers they bottle an award-winning Cabernet/Sauvignon blend, a straight Cabernet Sauvignon and their limited production but signature Sauvignon Blanc. With nearly 2,500 vines they are one of the largest vineyards in the Lamorinda area. More recently Larry and Esther undertook the construction of a local winery and tasting room on Mt. Diablo Boulevard. The intent of the tasting room is to allow growers and winemakers to showcase the truly outstanding wines made locally.

Page Yarwood, OD ’76
While enjoying semi retirement after 35 years with the Kaiser Permanente Medical Group, Dr. Yarwood is currently on the Alameda Contra Costa Counties Optometric Society Board of Directors serving as co-director of legislation. Page also stays active as a volunteer and art docent at the Oakland Museum of California, and is following her passion of collecting early California Impressionist paintings and photography.

1990

4 | Brent Chinn, OD ’92
Dr. Brent Chinn currently works in private practice at Precision Eyecare Centers in the South Bay. He shares his practice with fellow alumnus David Redman, Jessica Vu, and Linh Le. In April, he did us all proud as a contestant on Wheel of Fortune!

5 | Susy Yu, OD ’96
Dr. Yu was appointed to the board of directors for Optometry Giving Sight, a philanthropic organization that supports projects focused on building sustainable and scalable optometry-led programs that educate eye care providers locally and enable the establishment and delivery of vision care and eye health to all.

2000

Jennifer Hsieh, OD ’09
Dr. Jennifer Hsieh is a private practice owner with six wonderful employees. Her office is at Almaden Valley in San Jose. She is passionate about myopia management and has provided care for many children as well as fitted them with OrthoK and Multifocal contact lenses. Her office is one of the top practices in the country for fitting patients with Multifocal contact lenses. In her spare time, she likes to spend time with her husband and son and go on their weekend adventures.

2010

6 | Sheryl Reaves, OD ’11
Dr. Sheryl Reaves is currently an optometrist at Jessie Trice Community Health Center, serving Miami’s historically Black communities. She also serves on our school’s Alumni Board. She shared this photo of her daughter Sherry’s first birthday party. Also pictured is her husband Dorian Sr., and her son Dorian Jr., age 4.

Hey Alumni!
Do you have a story to tell? About your career or your life? We’d love to hear from you! Send us a pic and details:
optoa@berkeley.edu
Please visit our website to see more updates from our alumni:
optometry.berkeley.edu/alumni-notes

We’ve tracked down some of your favorite classmates. Here’s what they’re up to.
7 | Daphne Chan, OD ’13
Daphne joined the UCSF Department of Ophthalmology in 2015. She is associate chief of ophthalmology at UCSF and a fellow of the American Academy of Optometry. She serves as secretary of the San Francisco Optometric Society as well as the Bay Area Optometric Council. Daphne enjoys trying new foods, organizing events, watching Marvel movies, traveling, quoting and making references to the Harry Potter books, singing in the car, and spending time with friends and family, where she has gained the title of Favorite Auntie (and only) Auntie to her two nieces and one nephew. She talks shop with her optometrist dad (Alan Chan, OD ’72), and she shared fond memories of a recent VOSH trip to Jamaica, where she had the opportunity to provide free eye care alongside current students and fellow Berkeley alumni.

8 | Calista Ming, OD ’16
2023 has been an amazing year so far for Dr. Ming. She took full ownership of her practice, Premier Vision Care Optometry, in Lomita, California, a private practice focused on specialty contact lenses. She also had the privilege of being a Key Opinion Leader for Bausch and Lomb, helping educate and train optometry students and fellow optometrists in scleral contact lenses, and through the STAPLE Program, Calista helped to educate third year optometry students on soft toric and multifocal contact lenses. She is very excited to return to Berkeley in July to work with the current third year students. Besides her professional roles, Dr. Ming’s biggest title is “Mom” to her almost three year old boy and one year old daughter. Calista says this couldn’t all be possible without her husband, whom she recently celebrated a 5th anniversary in Bora Bora!

9 | Sloan Rajadhyaksha, OD ’17
Dr. Rajadhyaksha got married in June of 2023 and moved to San Diego, CA to open an optometry practice. Within 6 months she and her husband took over two optometry practices in north county San Diego from retiring doctors. She says, “It’s been an absolute adventure! We are currently in the process of expanding our first location to twice the size it is now. We are very excited to see what the future holds for our practice!” Over the last two years they have traveled to Costa Rica and Portugal, and plan to go to Paris this year for Ryan Ngo’s (her best friend) wedding. Ryan was a fellow classmate at Berkeley! She has also become an aunt to three beautiful nieces and nephews.

2020
10 | Joanna Toner, OD ’21
Dr. Toner currently practices at the Washington Permanente Medical Group. She recently welcomed the adorable Anthony James into the world.

11 | Janice Trang, OD ’21
After completing her optometry degree, Dr. Trang completed a residency program in ocular disease, geriatric optometry and low vision rehabilitation at the Veterans Affairs Palo Alto Health Care System. She currently works at UCSF and VA Palo Alto as an optometrist. Since her undergraduate years, she has volunteered with AlMAM (Alliance of Jamaican American Humanitarians) to attend and organize annual medical mission trips to Jamaica. So far, she has attended the medical mission trip to Jamaica in 2016, 2017 and 2018. This year, she was able to attend as a provider! This trip enables vision care for over a thousand patients each year and provides them with glasses, cataract surgery, and glaucoma treatment to improve their quality of life. Other Berkeley alumni on the trip included Dr. Eric Viloria (OD ’20), Dr. Michael Wong (OD ’21), Dr. Sam Lee (residency ’22), Dr. Sheila Soliani (OD ’19), Dr. Tran Bui (OD ’17).

In Memoriam

1950
12 | Jimmy Low, OD ’52
Laraine Greenwood, OD ’88, shares the sad news that her dad, Jimmy Low, passed away on June 3 at the age of 98-1/2. He died of natural causes and continued to live independently at home as he wished. He had a wonderful life filled with family and friends and was happily married to his wife Lillian for almost 57 years before she passed in 2007. The couple traveled the world together—often proudly wearing their Blue & Gold. Both mom and dad were dedicated Cal Alumni, and dad was always appreciative of the education and training he received at Berkeley and ultimately the career and life that followed. He had a life well lived and will be missed.

1980
13 | Donald Matsumoto, OD ’80
Donald Michiaki Matsumoto, of Manhattan Beach California, died April 2, 2023, at Torrance Memorial Hospital due to complications from cancer. He was born on August 21, 1954, to Akira and Mary Matsumoto in Gardena, California. Don attended UCLA (BA in Economics) before coming to Berkeley, where he was the recipient of the Golden Retinoscope Award. He was married to Cynthia Miyasaka, and had a daughter, Grayson. Don joined Pacific EyeCare in 1989 and became a partner in 1994. He was a fellow of the American Academy of Optometry, Diplomate of American Board of Optometry, Assistant Professor of Southern California College of Optometry (COCLA Clinic), and Medical Director of Vision Source. Don served on numerous committees, was chair of the Sponsorship Committee for the Los Angeles County Optometric Society, and had been an active member of the Asian American Optometric Society (AAOS). Dr. Matsumoto was known as the eternal Dodger fan. He collected bobble heads, baseballs, and even had two bleacher seats. In between exams, Don would listen to his transistor radio with the Dodger’s broadcaster Vin Scully calling out the plays. He said his life would not be complete until his team won the World Series again, which they did in 2020. Don will be greatly missed by his wife Cynthia, daughter Grayson, brothers Eddie and Mickey, and sister Susan, and his nieces, nephews and numerous cousins.

Gregory Alaniz, OD ’85
Greg was a devoted son, dedicated doctor and loyal friend. He practiced in San Diego, CA until his retirement. He departed this life too early. Greg will always be remembered for his intellect, quick wit and kindness. He will be missed.

Jara Matsumoto, OD ’81
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Proposed New Clinic

Plans are underway to build a new eye care center that will double our clinical capacity, expand opportunities for world-class education and research, and advance an exciting new model for integrated pediatric optometric care.

optometry.berkeley.edu/give