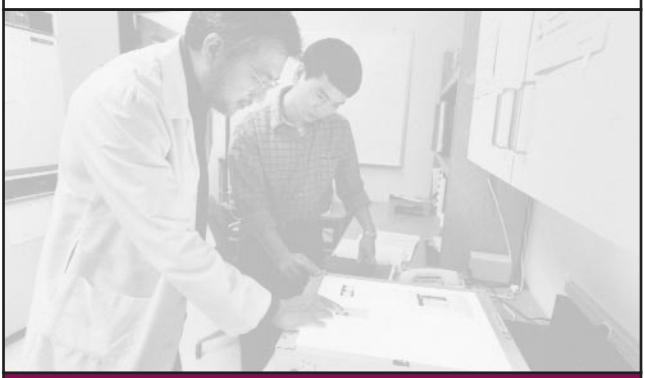
Winter 2004



Focus On Vision

Information from the Doheny Retina Institute

Our mission: *"…to relieve the suffering of our patients with severe retinal diseases…"*

Focus on Vision

From the CEO…

Dr. Eugene de Juan, Jr.

We hope you enjoy reading Focus On Vision—the newsletter of the Doheny Retina Institute. It is designed to share with you special, relevant information regarding vision research and treatment that is now available or planned for the future. We want you to be informed about procedures, treatments and therapies; to understand stories that have appeared in the media and explain what they mean to you and your family; highlight programs and seminars that you may wish to attend; and recognize the generosity of our donors.

Eugene de Juan, Jr., M.D.

Focus on Treatment

Plugging into the Visual World—Doheny Doctors Design a Retinal Prosthesis

Back in 1956, when Graham Edward Tassicker filed a patent for a retinal prosthesis concept that he claimed would ultimately restore sight to the blind, not many people took him seriously.

Just four years later, however, Giles Brindley made a step toward the realization of Tassicker's vision by surgically implanting a device into the visual cortex of his patients enabling them to perceive "spots of light." Then, as part of a groundbreaking study conducted in the 1990s to create a rudimentary retinal map, Doheny researchers enlisted the assistance of a few brave patients who remained completely awake while tiny metal wire electrodes were inserted within 0.5 mm of their retinas.

Today, researchers at the Doheny Retina Institute feel they are well on their way toward creating a true retinal prosthesis—an implantable microelectronic device designed to give functional sight to millions of people suffering from debilitating vision loss, primarily due to macular degeneration and retinitis pigmentosa.

A new field of biomedical engineering devoted to the creation of "neural prostheses" is working to create a variety of devices that employ electronic microchip implants to stimulate damaged nerve cells. The focus is on nerve cells because the central nervous system does a poor job of regenerating itself.

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According to Jim Weiland, director of the Intraocular Retinal Prosthesis Lab at the Doheny Retina Institute and an assistant professor of ophthalmology at the USC Keck School of Medicine, the depth of knowledge now achieved in several scientific disciplines has created a unique opportunity. "There is now an exciting convergence of microelectronics, material science engineering, neural science and medicine taking place that is enabling us to apply all the knowledge available to produce devices that will have a real impact on people's lives," he said.

At the Doheny Retina Institute, the first retinal prosthesis was implanted in February of 2002 in one of three patients authorized by the FDA. The system included a small camera mounted in a pair of eyeglasses, a receiver implanted behind the patient's ear, and a stimulator connected via a threadlike cable to a miniature electrode-studded silicone implant affixed to the lining of the eye's retina. A second patient received the implant in July 2002, and in March of 2003, a third patient received a refined version of the device. Though Dr. Weiland and others caution that the device is rudimentary, patients have already been able to "see" large shapes and movement.

"The next step is to enhance the vision of our patients to the point that it significantly improves how they can function in their daily lives," said Dr. Weiland. "I am confident that if we continue at our current rate of progress, patients will be able to learn to recognize a wide variety of objects and interact much better with their surroundings and other people. In fact, I am 99 percent certain that we will eventually create a device that will enable someone totally blind to recognize a human face."

Focus on the Future

The Operating Room of the Future at a Clinic Near You

A doctor walks into the operating room and issues a voice command to adjust the surgical system and lighting to his preferred settings. He then instructs the video equipment to begin recording, reaches for a robotic arm and confidently makes his first tiny incision into the patient's eye. Software steadies his hand as he precisely cuts the right depth into the vitreous body of the eye. Control of the lighting, pressure, cutting, infusion, aspiration and cautery are all automatically coordinated and, at each stage of the operation, interoperative diagnostic systems assure that the proper results are being achieved.

You might assume that such a sophisticated approach to ophthalmic surgery would take place in the operating room of the future in leading medical institutions, with plenty of other doctors and nurses on hand to assist. Doheny/USC doctors and engineers, however, see the future playing out a bit differently. After a few more years of work at the Microsurgery Advanced Design Laboratory (MADLAB), they believe they will have what they need to make this futuristic scenario play out repeatedly in the more common, office-based surroundings of thousands of treatment clinics across the country.

For more than two years, the MADLAB's mission has been to "apply technology toward microsurgery in innovative and novel ways such that patient lives are enhanced through improved microsurgical technique." The technology now being developed at the lab includes everything from instruments as small as

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one-fourth normal size, capable of working within incisions that do not require suture, to advanced computer systems that allow several instruments to be controlled at the same time through voice activation. Even setup of the equipment will become easier as software wizards guide the step-by-step process.

One of the first products ready for market due to the work done at the MADLAB and through sponsorship assistance from Bausch & Lomb, is the TSV25 minimally invasive surgical system. Using miniaturized 25-gauge tools—about half the size of former instruments—this system allows surgeons to perform vitreoretinal surgery through small needle punctures, thereby reaching the retina without actually cutting into the eye.

This summer, a three-year, $3 million grant was contributed to the MADLAB by Bausch & Lomb that will fund the next generation of technologies and equipment. Plans are underway to create "the ophthalmic operating room of the future." Both doctors and patients will benefit as technology automates complex surgical procedures, enabling them to be safely and efficiently conducted in less formal, office-based settings.

Dr. de Juan and others expect great things for the future as a result of the work at the MADLAB and contributions from its partners. In addition to financial assistance, Bausch & Lomb scientists will participate in cooperative research programs at Doheny/USC. "We have greatly expanded our ability to contribute to the development of advanced technologies," said Dr. de Juan, "and I am very excited about the plans to accelerate our progress."

Focus on Philanthropy

The Hoag Foundation: Supporting Breakthroughs in Vision Research

From the first look at a mother's smile to the last glimpse of a spectacular sunset, there is no denying the tremendous impact that vision has upon our human experience. People who financially support research that can improve eyesight—or even restore it—form an enlightened community that touches every one of us. The Doheny Eye Institute has benefited greatly from one important member of that community named the George Hoag Family Foundation.

As doctors at Doheny/USC conduct their research, it is very important that they have the best technology available to accurately diagnose various conditions and detect subtle physiological responses to new treatments. To make that possible, the Hoag Foundation has made some vital contributions, including state-of-the-art digital ocular imaging equipment. This equipment has enabled Doheny scientists to quickly diagnose thousands of cases and make rapid progress in research. One such project now underway promises to slow or halt the advancement of macular degeneration, a leading cause of irreversible vision loss in industrialized nations.

The Hoag Foundation charter guides it to "promote and engage in charity that improves human welfare or alleviates pain and suffering." Among the many other organizations that benefit from the organization's contributions are the Hoag Hospital in Newport Beach, California, the Boys and Girls Clubs in Los Angeles and Orange Counties, the Foundation

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for the Junior Blind and the Los Angeles Regional Food Bank.

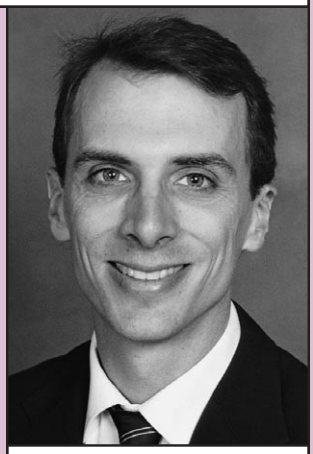
Melinda Hoag Smith, CEO of the Foundation, said, "Since the 1940s, the Hoag Foundation has been focused on serving healthcare, social service and youth related charities in California. It was the desire of my father and grandparents to give back to their community and especially to people with fewer opportunities."

George and Grace Hoag started out modestly enough in 1896, spending their first year of marriage running the Golden Rule general store in Wyoming. She worked behind the counter, he swept the floor. The store became part of the thriving J.C. Penney chain, with Mr. Hoag opening stores across Utah, and later becoming company vice president in New York. Mr. and Mrs. Hoag grew quite wealthy from their J.C. Penney stock—and then they set about giving much of it back to people in need by donating millions of dollars to scores of charities over the years.

The 63-year-old Hoag Family legacy of generosity continues to impact the lives of people around the globe. On behalf of the Doheny/USC doctors and patients touched by such giving, the editorial staff of this newsletter would like to thank the Hoag Family Foundation for its consistent support.

Focus on Faculty

How No Eye Has Seen Before



Dr. Jim Weiland

Dr. Jim Weiland, 37, is assistant professor of ophthalmology at Doheny/USC and the laboratory director in a field that promises to greatly improve the lives of people with previously untreatable retinal disease. So how did this young scientist make his way into one of the most exciting areas of ophthalmic research? The answer gives courage to anyone considering a difficult career change.

Back in the early 1990s, Jim Weiland decided to quickly end a career in the up and down world of aerospace engineering. The leading companies in aerospace were having it tough, and after working on jet engines for Pratt & Whitney for four years, Jim didn't see the industry outlook improving anytime soon. "Aerospace was going through a lot of layoffs and the future wasn't bright. I decided to go back to the University of Michigan to find something more interesting to do," said Dr. Weiland.

It turned out to be the best career decision he ever made. To complement his bachelors in electrical engineering, Jim Weiland earned a graduate degree in the promising field of biomedical engineering. He gradually became interested in continuing his studies in the field

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of neural prostheses. For his postdoctoral work, he searched for "that something special" one of his professors in electrical engineering had recommended. "He said I should look for an area of research where not much had been done but where there was big potential. I didn't want to choose a field where I could just make incremental contributions," said Dr. Weiland.

He knew he had found something to build a substantial research career upon when he attended a presentation about retinal prostheses delivered by Dr. Mark Humayun from Johns Hopkins University. Retinal prostheses are electronic implants that tap into the eye's nervous system to enable basic visual recognition of objects. Since the body doesn't do a very good job of healing nerve cells, scientists are turning to microelectronics to replace as much of their functions as they can.

Several weeks after Dr. Humayun's presentation, Jim Weiland contacted him about doing postdoctoral work in his lab at Johns Hopkins University. It proved to be an excellent partnership that would take the two of them to the USC Keck School of Medicine. They joined the Doheny Eye Institute in 2001 as part of a larger group of faculty that collectively founded the Doheny Retina Institute. Dr. Weiland is now the director of its retinal prosthesis laboratory and one of the founders of a new engineering research center to be established at USC to focus on implantable microelectronics.

His current studies have produced outstanding results with the first wireless retinal stimulator. Three blind participants implanted with this permanent retinal prosthesis have been able to detect light and motion, identify patterns and locate objects. "In the next 10 to 20 years, I expect neural prostheses to make measurable improvements in the lives of people who are blind and paralyzed. Eventually, they should enable people to recognize a variety of objects, and even recognize people's faces," says Dr. Weiland.

FOCUS ON VISION

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