Michael H. Goldbaum, MD, MS

CELEBRATING

40 YEARS

Michael H. Goldbaum, MD, Professor of Ophthalmology and Co-Director of the Retina Division, has been with the UC San Diego Department of Ophthalmology since 1977, longer than any other faculty member. This coming year marks his 40th anniversary in the Department. He has observed and participated in much growth and innovation in the Department of Ophthalmology over this extraordinary period.

Dr. Goldbaum's ophthalmology training began at Tulane University in 1966. During the Vietnam War, after a year of residency at Tulane, he entered the Navy. He completed his ophthalmology training at the US Naval Hospital in Oakland, California. After five years in the Navy, he was a retina fellow at New York Hospital Cornell Medical Center from 1972-1973.

His academic career began in 1973 at the University of Illinois Eye and Ear Infirmary in Chicago, where he participated in the groundbreaking Television Ophthalmology Project which was one of the first applications of digital imaging in medicine. In 1975, he conceived a method of automated computer diagnosis from images of the retina which was named Structured Analysis of the Retina (STARE).

He was recruited to the UC San Diego School of Medicine Division of Ophthalmology in 1977 by David Worthen, MD, who was then Chief of the Division of Ophthalmology, when the practice was located in Hillcrest.

In 1987, he sought funding from the National Eye Institute (NEI) of the National Institutes of Health (NIH) for the revolutionary STARE project. Automated computer diagnosis from medical images had never been done. There was no previous body of scientific work and no other scientists doing similar work, and the NEI had no scientists with knowledge in the area of research to review the STARE project. Therefore, an ad hoc review committee of retina scientists was assembled to evaluate if this brand new area of research was feasible and worth supporting. The grant was funded, and this groundbreaking project turned out to be successful. The STARE project was supported by the NEI from 1987 to 2000 and then reactivated in 2013.

The pioneering STARE research project created the methods that are now used by other researchers focusing on computer analysis of medical images around the world. Some of this research led to uses outside of medicine. For example, most recently, this method of measuring the bending and twisting of blood vessels in the retina has been applied to satellite images to measure the curvature of rivers.

As the Department grew in the 1980's, Dr. Goldbaum initiated a specialized retina service for treating intraocular tumors and retinopathy of prematurity. Over the years, he has seen thousands of retina patients, including those that sometimes are the most difficult to diagnose. In addition to his clinical practice, teaching and research, he has participated in

Lab 1979

Project Orbis 1983 Surgery

Clinic 2013

"My interest over the past 25 years has been computational ophthalmology, particularly the use of computers to analyze and diagnose images of the ocular fundus. We have used machine learning methods to find hidden damage from HIV retinopathy in patients with no other evidence of HIV. Our latest work is the use of deep learning to classify images of diabetic retinopathy."

Many scientists make valuable contributions to the medical community and for the care of patients by refining existing areas of research. Dr. Goldbaum has gone a step further by imagining two new disciplines of research and developing the original methods for these disciplines to advance medical knowledge and care. The STARE project and MAGI form the basis of research that is now being taken up by other researchers.

Dr. Goldbaum states, "I am proud to have been a part of the Department of Ophthalmology for 40 years and grateful for the opportunities that I have had to contribute to the research that was uniquely possible at UC San Diego."

Over these many years of clinical practice, teaching and research, Dr. Goldbaum had a supportive family which includes his wife Brenda and children David, Stephen and Rachel. His children and 7 grand-children are now spread across the globe from San Diego to New York and Australia. He is also an avid bicycle enthusiast and has ridden all over the United States, Canada, and Europe.

> "I hope that making a contribution to medical knowledge, teaching, providing compassionate and quality care for my patients, and being a resource in Southern California for the care of patients with pediatric and geriatric eye tumors will be my legacy."

several medical missions around the world. On these missions, Dr. Goldbaum taught vitrectomy and new retinal and laser surgery methods to students and physicians in the following countries: China, Ukraine, Italy, Philippines, Russia, Thailand, Georgia, Kyrgyzstan and Kazakhstan.

In 2000, when the NEI began to support outcome-driven research, Dr. Goldbaum pioneered another area of research that did not previously exist. The project, Medical Advances through Glaucoma Informatics (MAGI), uses what is commonly referred to as neural networks and scientifically called machine learning classification to improve the diagnosis and management of glaucoma. This was among the earliest research considered to

be "Big Data". Working with the Department's glaucoma team led by Robert N. Weinreb, MD, Linda Zangwill, PhD and Pam Sample, PhD, new research methods were created demonstrating that machine learning methods could improve the diagnosis of glaucoma from visual fields. "Dr. Goldbaum is an early visionary who understood the importance of applying artificial intelligence and machine learning to glaucoma diagnosis", said Dr. Weinreb.

Since then, Dr. Goldbaum and his Hamilton Glaucoma Center collaborators have applied their methods to glaucoma imaging for diagnosis to predict which eyes will develop glaucoma and to detect which eyes with glaucoma are deteriorating.