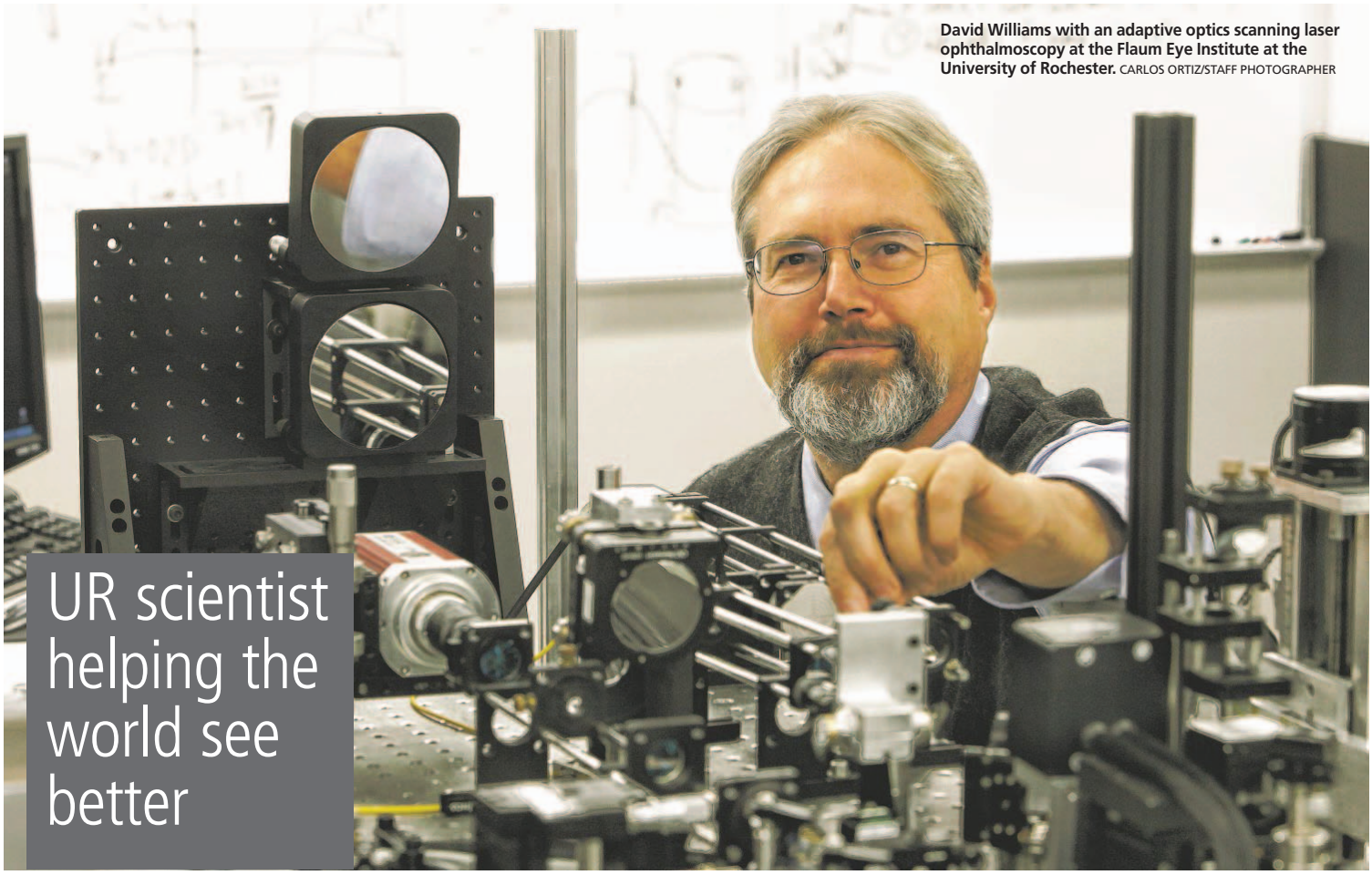

David Williams with an adaptive optics scanning laser ophthalmoscopy at the Flaum Eye Institute at the University of Rochester. CARLOS ORTIZ/STAFF PHOTOGRAPHER

UR scientist helping the world see better

Catching up with David Williams

Jinelle Shengulette

It was a career moment for a University of Rochester scientist.

In September, David Williams, 59, traveled to the Champalimaud Foundation in Lisbon, Portugal, to receive one of the highest honors in the field of vision science and ophthalmology, the António Champalimaud Vision Award.

"The president of Portugal presented (the award) as the sun set gloriously into the ocean behind us. My wife Inger was with me. It was a magical moment that you can't imagine you would be lucky enough to experience even once in an entire lifetime," said Williams, who is a faculty member of UR's Institute of Optics, director of the school's center for visual science and dean for research of arts, science and engineering.

The award carried a $630,000 prize for future research in adaptive optics, a process that provides "the sharpest pictures ever of the inside of the living eye," said Williams, a Fairport resident.

Methods developed by Williams and his team are currently used in LASIK procedures around the world.

Now back home, we caught up with Williams to discuss how astronomy influenced his work and how the ability to better see cells in the retina is advancing treatment of retinal diseases and helping improve vision.

Researchers at the University of Rochester are using adaptive optics to correct the light as it passes through the cornea and lens of the eye, providing the sharpest pictures ever of the inside of an eye. CARLOS ORTIZ/STAFF PHOTOGRAPHER

We were proud to share: The Champalimaud award with a group from MIT who developed another novel technology for taking better pictures of the inside of the eye called optical coherence tomography. Adaptive optics and optical coherence tomography complement each other very well, and it was thoughtful of the jury to honor both with a single award.

Adaptive optics is a technology: We borrowed from astronomy. The most powerful telescopes on the surface of the Earth can take sharper pictures of the stars by using adaptive optics to correct light as it passes through the atmosphere. We use adaptive optics to correct the light as it passes through the cornea and lens of the eye, providing the sharpest pictures ever of the inside of the living eye.

My colleagues and I began working with Ian Cox at Bausch + Lomb Inc.: More than 15 years ago on new methods to improve vision beyond ordinary glasses and contact lenses. The first step is to measure the defects in patient's eyes more accurately than ever before by using the automated wavefront technology we invented in our laboratory. We can then … fabricate contact lenses that exactly match particular defects to each eye.

The wavefront sensor (invented in our lab): Measures the aberrations of the eye and the deformable mirror (which can be warped into a shape to compensate for the aberrations) corrects them. Once this is achieved, a patient looking at the world through this special mirror has improved vision, better than can be provided with ordinary glasses or contact lenses. The mirror can also be used to look inside a patient's eyes with greater clarity.

Adaptive optics turns a patient's eye: Into a high-resolution microscope, allowing us to see the rods and cones, and many other kinds of cells, in the living eye. In fact, it is this application of adaptive optics, to take ultra-sharp pictures of the inside of the eye, that is the main focus of our laboratory today.

About two dozen faculty, students and staff at UR: Have formed a group called the Advanced Retinal Imaging Alliance. We use adaptive optics technology to answer fundamental questions about how the normal eye works. For example, we showed for the first time how the three kinds of cones responsible for color vision are organized in the retina. We can see effects of disease on single cells in the retina that have never been visible before, and this is accelerating the development of effective drug therapies for diseases of the retina.

Shengulette is a Rochester-area freelance writer. Submit story ideas and comments to RocNext@DemocratandChronicle.com.