

Coming soon to an optometrist's office near you: Wavefront analysis

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Techniques developed by astronomers seeking a clear view of objects in space are coming closer to home, as eye care professionals apply the concept of wavefront optics to understanding—and correcting—subtle visual abnormalities of the human eye, according to a special article in the September issue of [*Optometry and Vision Science*](#).

Wavefront optics is beginning to transform the way [optometrists](#) and ophthalmologists think about the vision issues they encounter in everyday practice, according to the review by Larry N. Thibos, PhD, FAAO, of the School of Optometry at Indiana University, Bloomington. In recognition of his pioneering role in applying wavefront measurement to clinical optometry, Dr Thibos was named the 2012 Charles F. Prentice Award Lecture Medalist.

Wavefront Optics—From the Observatory to Your Optometrist's Office

"The aim of this lecture, and its publication in *Optometry and Vision Science*, is to help make advances in these areas of optometric science broadly accessible to educators, clinicians, and patients by explaining in simple terms the underlying optical concepts of wavefront aberrometry," according to Dr Thibos. He presents and illustrates the key concepts underlying the application of wavefront measurement in evaluation of subtle, "higher-order" visual abnormalities.

Historically, optometrists and ophthalmologists have focused on the two most prominent causes of [vision problems](#) from out-of-focus images: spherical errors and astigmatism. However, there are a wide range of subtle, "higher-order" errors that can affect not only the clarity of a patient's vision but also the doctor's view as he or she examines the back of the eye.

"In the past two decades, optometry and ophthalmology researchers have borrowed techniques for measuring and correcting these higher-order abnormalities," explains Anthony Adams, OD, PhD, Editor-in-Chief of Optometry and Vision Science. "Astronomers already used these techniques to enable a clear telescopic view of planets and stars, undistorted by the focusing aberrations resulting from the earth's atmosphere."

Dr Thibos writes, "Our change in mind-set engendered by wavefront concepts has the power to alter our way of thinking about many clinical issues that are fundamentally optical in nature." He summarizes key principles of wavefront optics and their clinical applications to vision correction. Dr Thibos foresees important uses such as monitoring changes in optical quality in eyes with deterioration of the tear film (eg, causing dry eyes), assessing the outcomes of advanced vision-correcting (refractive) therapies, and tracking the progression of visual abnormalities in growing eyes.

Some vision care professionals already have access to next-generation instruments that can assess and correct for these higher-order aberrations in the back of the eye. Dr Adams notes, "Some of these corrections are even finding their way into contact lens and spectacle designs."

Dr Thibos provides a "masterful and remarkably clear" explanation of the new technology and its potential impact on vision correction, according to Dr Adams. The article presents a number of diagrams and

other teaching tools—including a paper airplane designed to illustrate the three-dimensional nature of optical wavefront analysis. (You can download the paper airplane in PDF format at <http://links.lww.com/OPX/A136>.)

For his long-time research discoveries, Dr. Thibos was named winner of the American Academy of Optometry's Charles F. Prentice Medal for 2012. Established in 1958, the Charles F. Prentice Medal is awarded annually to an outstanding scientist who has contributed significantly to the advancement of knowledge in the visual sciences.

"Dr Thibos is quite unique in his extraordinary ability to relate these advances in optics to the very fundamentals of ophthalmic optics which the 'Father of Optometry,' Charles F. Prentice, articulated more than 120 years ago," Dr Adams comments. "It is fitting that he was awarded the Charles F. Prentice Medal for his work—the highest Award of the American Academy of Optometry." Dr Thibos' paper is free to the public [on the journal](#) website, along with a downloadable video of his original award lecture, including a version for the hearing impaired.

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