Galileo Galilei, the father of experimental science, taught that to understand nature you must measure nature. His contemporary, Christoph Scheiner, explored the nature of eyes as optical instruments and discovered how to measure the eye’s focusing distance simply by viewing a point of light through closely spaced pinholes in an opaque card. Two centuries later, Thomas Young used Scheiner’s principle to construct the first optometer capable of measuring ocular astigmatism as well as focusing errors of the eye. Another two centuries passed before Liang, Brimm, Goelz, and Bille expanded Young’s optometer to measure higher order aberrations with the first ophthalmic wavefront aberrometer. This development expanded the scope of optometry far beyond measuring spherocylindrical refractive errors to include a plethora of optical flaws such as spherical aberration, coma, and trefoil. This instrument rapidly moved from laboratory to the clinic in 2000, symbolically positioning aberrometry as the modern method of choice for measuring the optical characteristics of normal and clinically abnormal eyes. At the same time, consensus was reached on a systematic scheme for mathematically decomposing the complex aberration structure of individual eyes into elemental components and for measuring their strength in terms of Zernike coefficients.

This issue of *Optometry and Vision Science* features progress in the application of wavefront aberrometry to clinical optometry. The variety of topics examined and the geographic distribution of the authors clearly demonstrates the global deployment of aberrometry to examine clinically challenging optical problems. Changes in ocular aberrations, retinal image quality, and functional vision associated with aging, accommodation, myopia, peripheral vision are also being characterized with wavefront aberrometry. As we learn more about these diverse conditions, standards are beginning to emerge that will help guide clinical diagnosis and monitoring treatment outcomes in the future. Problems encountered when investigating clinical populations are, in turn, prompting basic vision scientists to re-examine past assumptions and potential measurement artifacts associated with current aberrometry technology. For example, although lower order aberrations vary little with pupil size, there is a growing awareness that higher order aberration measurements depend critically on pupil size (cite the PRK study), which will vary with age, illumination, accommodation, and binocular vergence.

During the last decade, the primary clinical implementation of aberrometry has been within the refractive surgery arena (e.g. cite PRK paper in this issue), but research included in this feature issues highlights several other important developments. It is now possible to employ the same Zernike polynomial descriptions of cornea and the whole eye, formally connecting the structural measurements of the cornea to their optical impact on refraction and vision (cite). Also, aberrometry looks positioned to be employed as the tool of choice in the manufacture of custom RGP lenses for highly aberrated eyes. Finally, there is a sense that we may be approaching a time when it is no longer necessary to ask the patient, which lens is better, #1 or #2. Wavefront aberrometry, coupled with a powerful optical theory for quantifying the quality of the retinal image, is providing reliable, objective and comprehensive refractive measurements for guiding and
monitoring optical therapy. Reliable optical measurements will, in turn, allow the clinician to concentrate on other, equally important aspects of treatment like effectiveness, comfort, convenience, cost, and availability that are of critical importance also for reducing the burden of uncorrected refractive errors in developing nations.