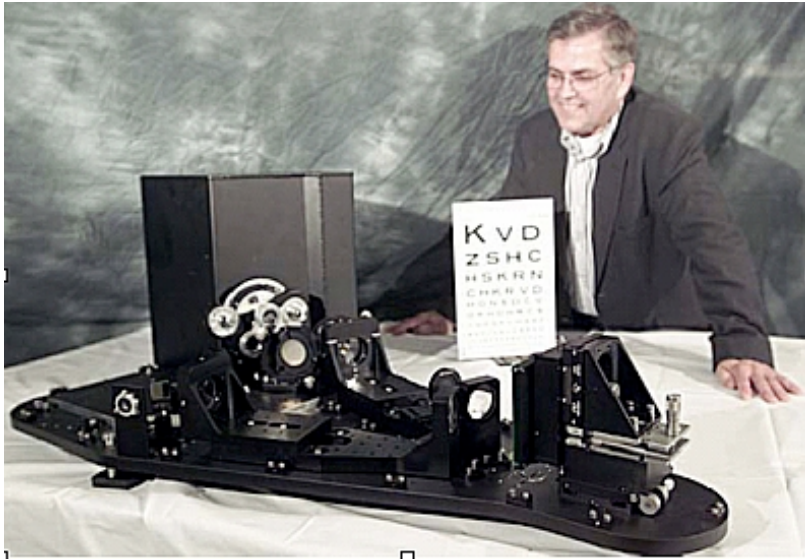# Vision Correction in the 21st Century

Traditional phoropters used by ophthalmologists and optometrists are used to both measure and correct vision in order to derive an optical prescription for the patient. The MEMS-based Adaptive Optics Phoropter (MAOP) replaces traditional phoropters and enables them to accurately diagnose and treat patients with high-order visual aberrations. These aberrations such as coma and spherical aberrations have, in the past been difficult to measure and correct.

MAOP utilizes adaptive-optics technologies and MEMS-based deformable mirror technologies originally developed for astronomy applications for wavefront correction. The MEMS deformable mirror reduces size requirements for the instrument and uses off-the-shelf commercial components, allowing it to be affordable and suitable for clinical environments. It does this without any loss in precision or response speed.

The use and appearance of the MAOP is similar to that of traditional phoropters, except the clinician does not need to perform any of the manual steps. The results also are significantly improved and more precise. The wavefront corrector on the MAOP applies the appropriate correction, automatically calculated by the wavefront sensor. This data is then combined with the patient's subjective response to attain the best correction and compensate for higher-order aberrations.

MAOP also enables clinicians to more successfully detect, diagnose, and treat retinal diseases, such as retinitis pigmentosa, glaucoma, diabetic retinopathy, and macular degeneration.

The system was developed by a team of researchers at Lawrence Livermore (Calif.) National Laboratory in collaboration with Bausch & Lomb, Rochester, N.Y., **Boston Micromachines Corp., Watertown, MA.**, Sandia National Laboratories, Livermore, Calif.; University of Rochester, N.Y., and Wavefront Sciences, Albuquerque, N.M.