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Introduction

Optical MEMS adaptive optics devices have made considerable recent technical progress and are now in use in many application areas. In this volume we report on the latest developments in the areas of adaptive optics technology, and the uses of this technology in the fields of astronomy, microscopy, and wavefront shaping. New adaptive optical technologies have been developed to accelerate wavefront control using field-programmable gate arrays (FPGA) for applications that are too fast for conventional software control loops. New applications also include focus tunable Moiré lenses and light carbon reinforced telescopes. In astronomy, MEMS devices are now being fielded at large telescopes (Gemini South, Lick, and Subaru) for on-sky corrections, opening up new science such as direct detection of exoplanets. In microscopy, adaptive optics are being use to overcome refractive aberrations that limit imaging resolution through thick tissues in widefield, confocal, and two-photon microscopy and ophthalmoscopes in vision science. Adaptive optics are also being applied to super-resolution microscopy to beat the diffraction limit using STimulated Emission Depletion (STED), Structured Illumination (SIM), and Stochastic Optical Reconstruction Microscopy (STORM). Adaptive optics are also beginning to be used for wavefront shaping to overcome scattering in biological tissues and in endoscopic imaging through single multimode optical fibers, opening up new application areas in biological imaging.

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