



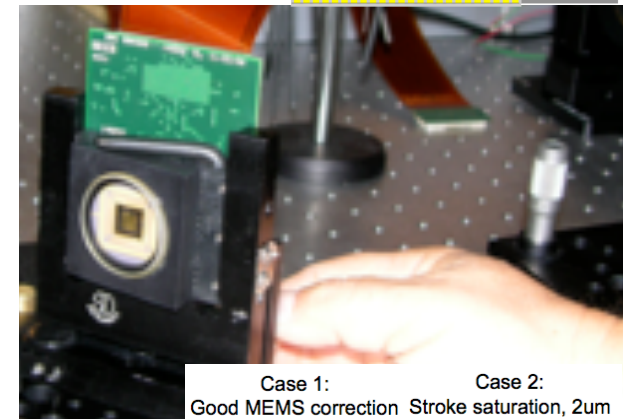
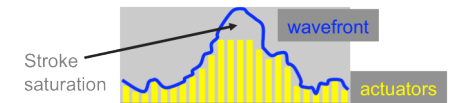
Adaptive optics & high-contrast imaging



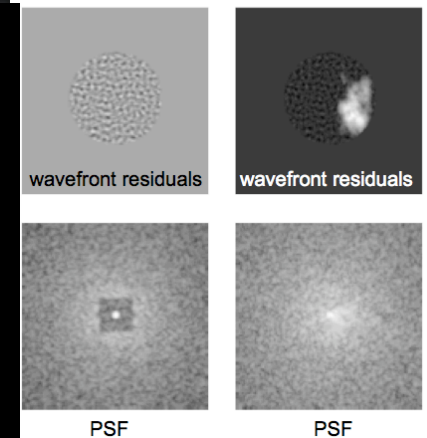
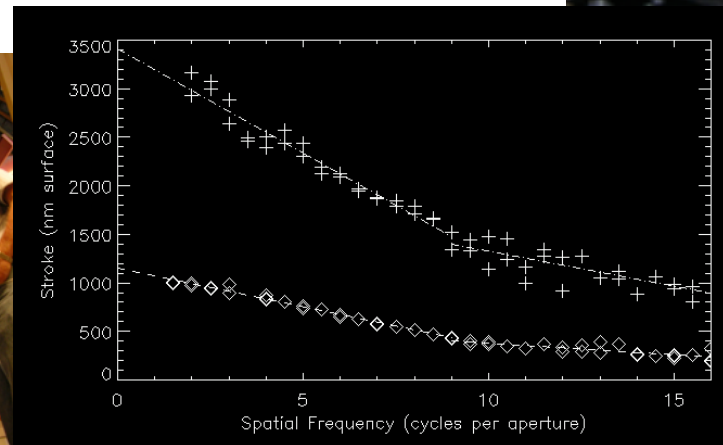
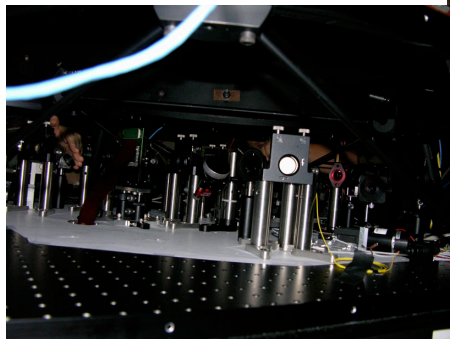
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I. Experiments with MEMS deformable mirrors

- Broad influence function limits mid-to-high-spatial-freq. stroke:
 - 70-cm-pitch woofer mitigates saturation on 8-m Gemini to 4-5 σ
 - Contributed to selection of the Gemini Planet Imager woofer
- MEMS for open-loop control:
 - Sub-nm stability, position repeatability, & hysteresis
 - Phase-to-volts MEMS model
- Open-loop control works as well as closed-loop:
 - ViLLaGEs on-sky AO testbed at Lick Obs. 1-m Nickel telescope
 - Visible- λ MEMS-AO



Case 1: Good MEMS correction Case 2: Stroke saturation, 2 μ m





II. LOCI high-contrast imaging survey for faint companions (thru. brown dwarfs) to solar-type stars

- NGS AO deep imaging in near-IR
 - Keck-10m and Lick-3m, 2005-2009
 - Epoch 1: 88 main-sequence Hyades stars
 - Epoch 2: ~40 binaries & BD candidates
 - Probing 5-230 AU
 - Mass limit: $\sim 0.02 M_{\odot}$ BD
 - Contrast limit: $\Delta H \sim 10-13.5$
- Locally-Optimized Combination of Images
 - LOCI is a least-squares minimization algorithm
 - Combines images to construct PSF that minimizes residuals
 - Lafreniere et al. 2007 ApJ 660

