Achieving higher contrast and spatial resolution with SCI+Aperture Masking with small resource requirements

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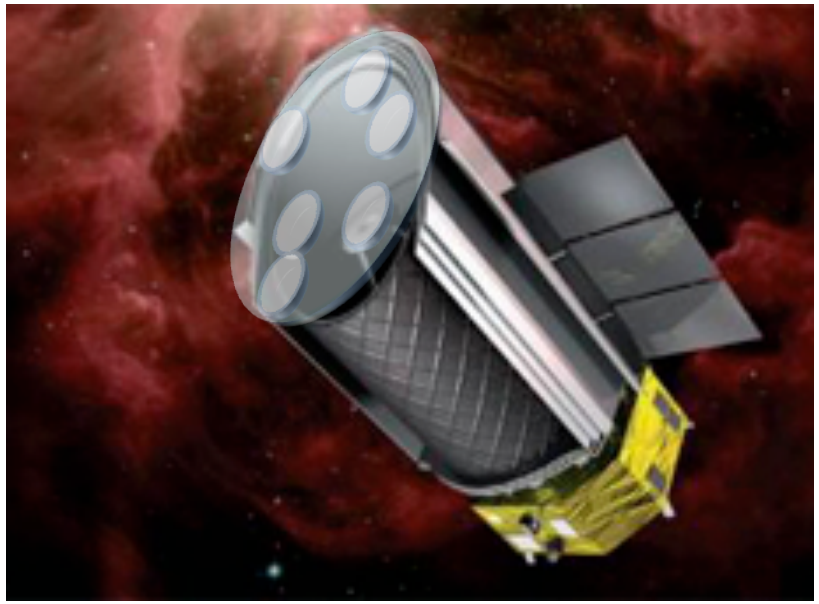
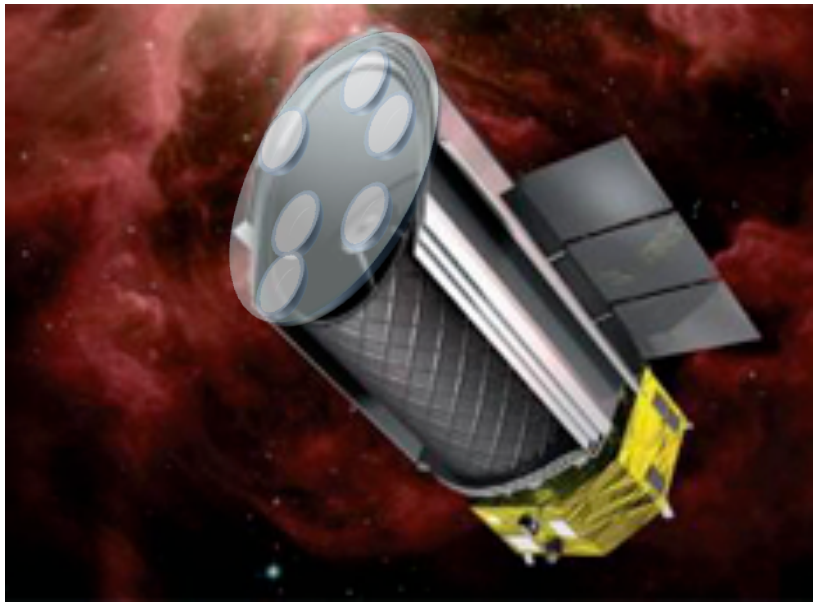


What is “Aperture Masking”

- Aperture Masking is interferometry
- Technique to precisely recover an original PSF from a degraded image
- A plate with several holes at a pupil position will do



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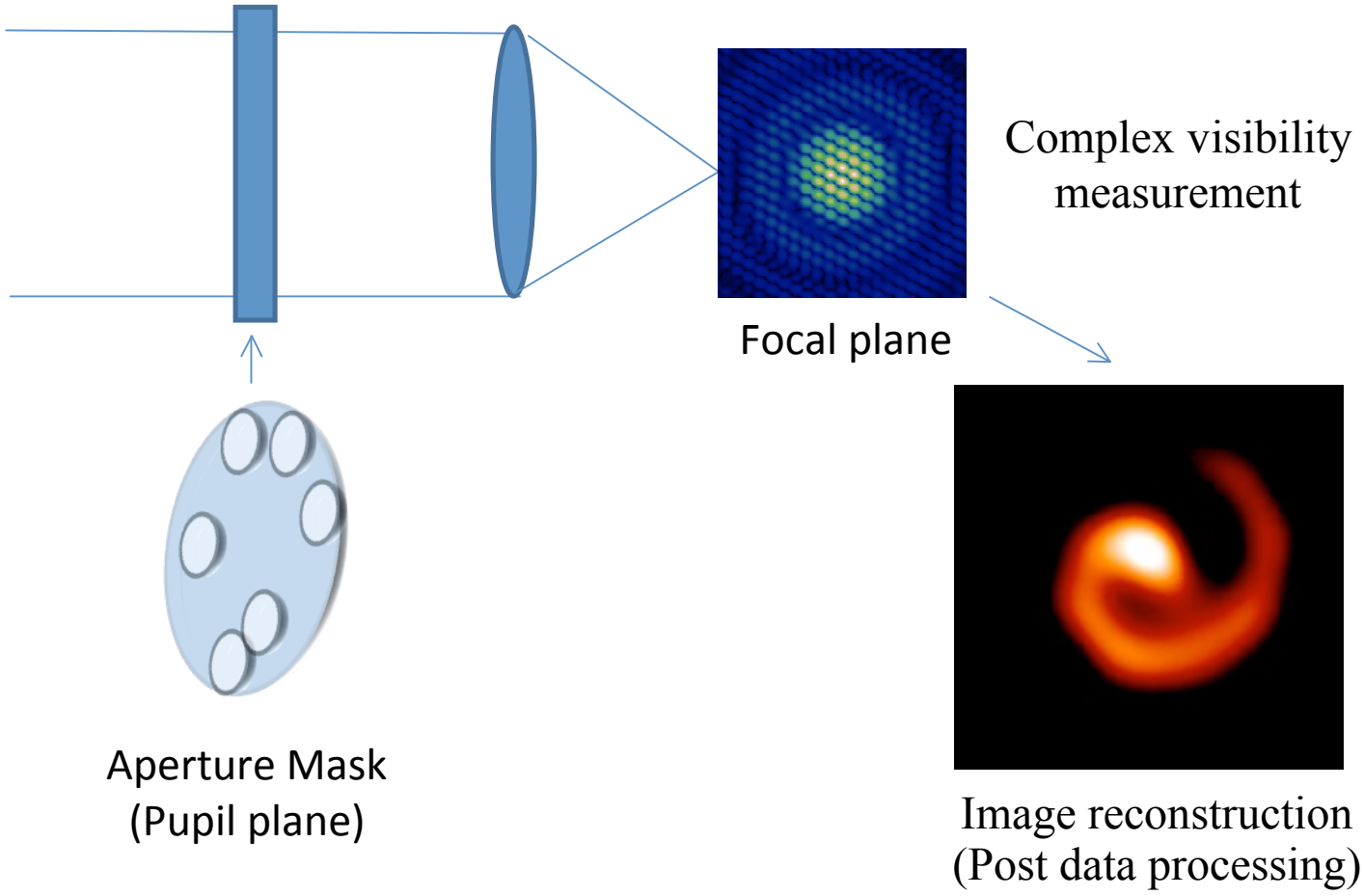
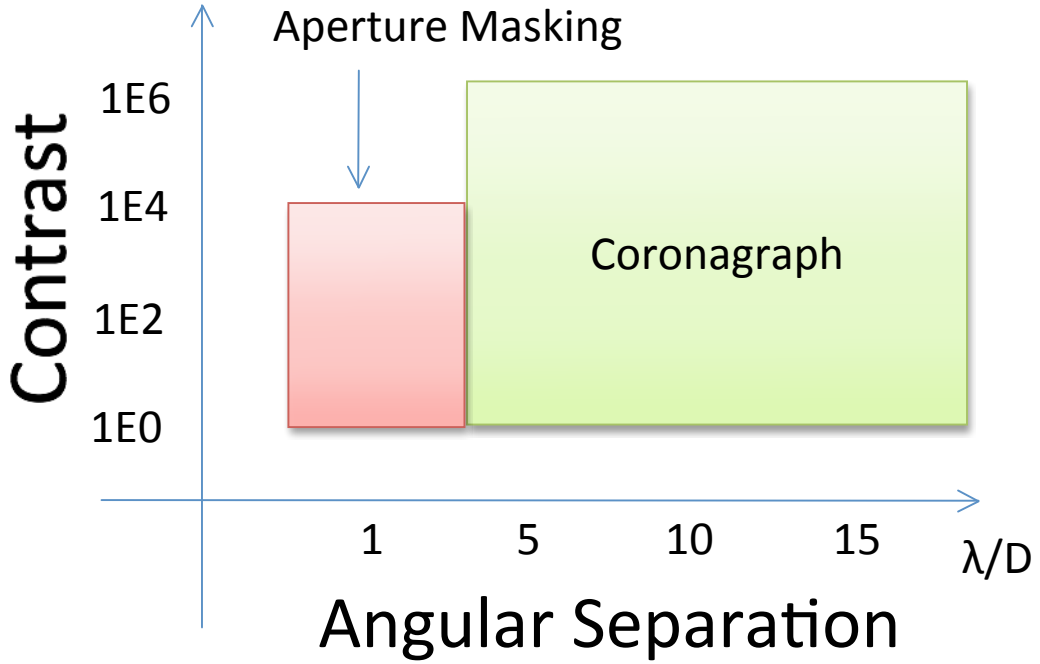
Aperture Masking is interferometry: How it works



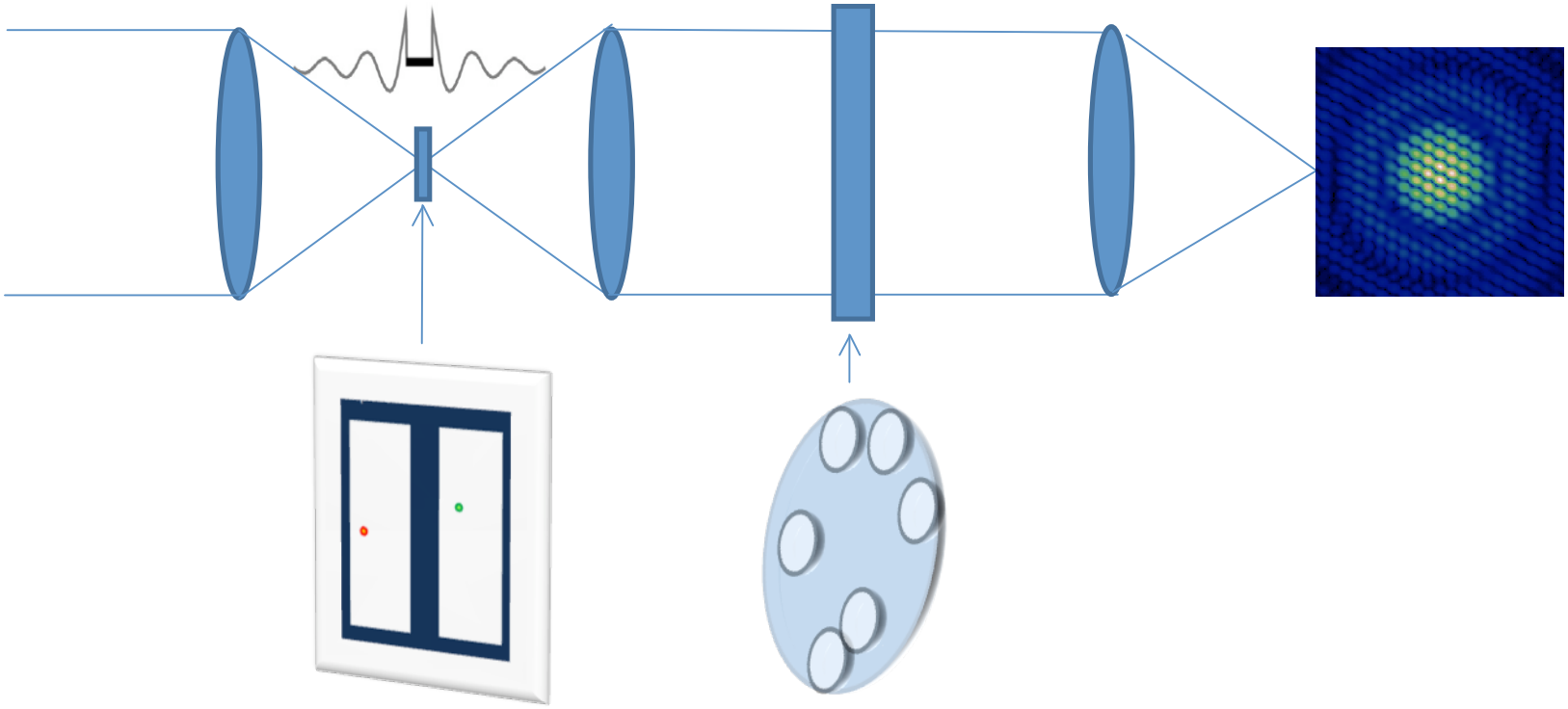
Technique to precisely recover an original PSF from a degraded image

Advantages and limitations of Aperture Masking

- **Very high angular resolution (0.5 λ/D), moderate contrast (~10^4)**
- **Not sensitive to wavefront errors**
- **Minimum resource requirement**
- Limited FoV
- Contrast is limited by Photon noise of a parent star
- JWST/TFI employs aperture masking



Coronagraph + Aperture Masking
= High contrast with high-angular resolution



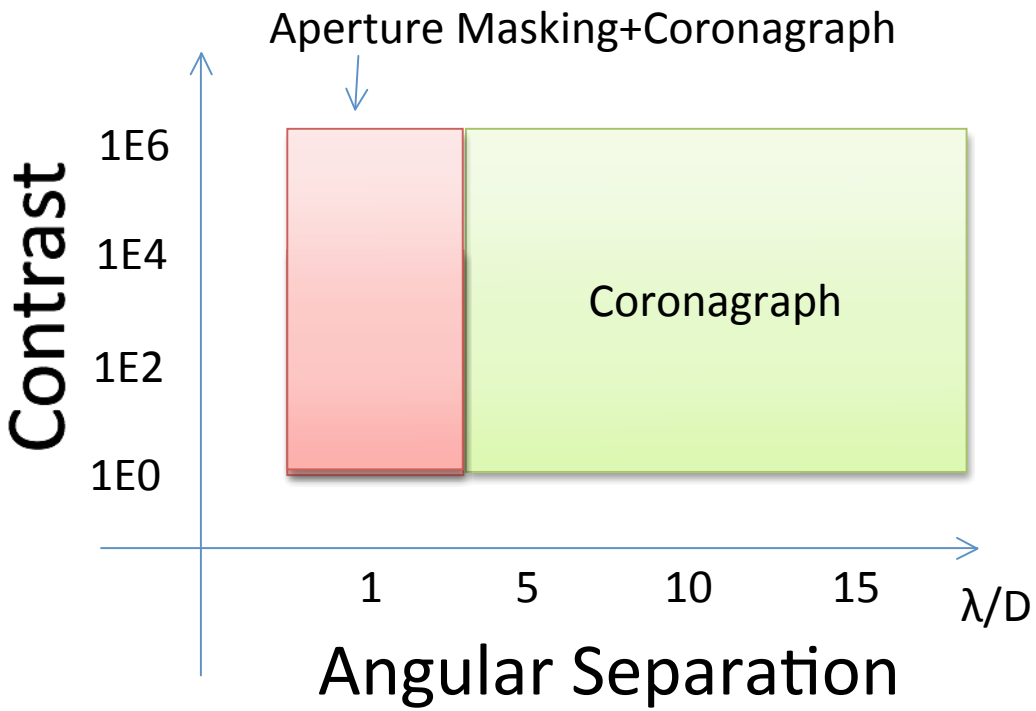
Focal Plane Mask

Aperture Mask
(Lyot stop)

- 10^2 contrast gain by Lyot type coronagraph
- 10^4 contrast by Aperture Masking
- ~ 10^6 Contrast from 0.5 λ/D (SCI: 10^4 ~ 10^6 from 3.3 λ/D)
- No need for the major modification of the current optical design

Coronagraph + Aperture Masking
= High contrast with high-angular resolution
with small resource requirements

- **Very high angular resolution (0.5 λ/D), very high contrast (~10^6)**



Summary: Gains of aperture masking (+coronagraph)

- Very small IWA (3.3λ/D ⇒ 0.5 λ/D)

⇒ Detection of inner planets (<10 AU)

- Short wavelengths (< 10 μm): Contrast limit (<10^4)

⇒ High contrast even with large wavefront errors

- Long wavelengths (>10 μm): Sensitivity limit, but poor angular resolution

⇒ Higher angular resolution

- ***Performance over JWST!***

Thank you!