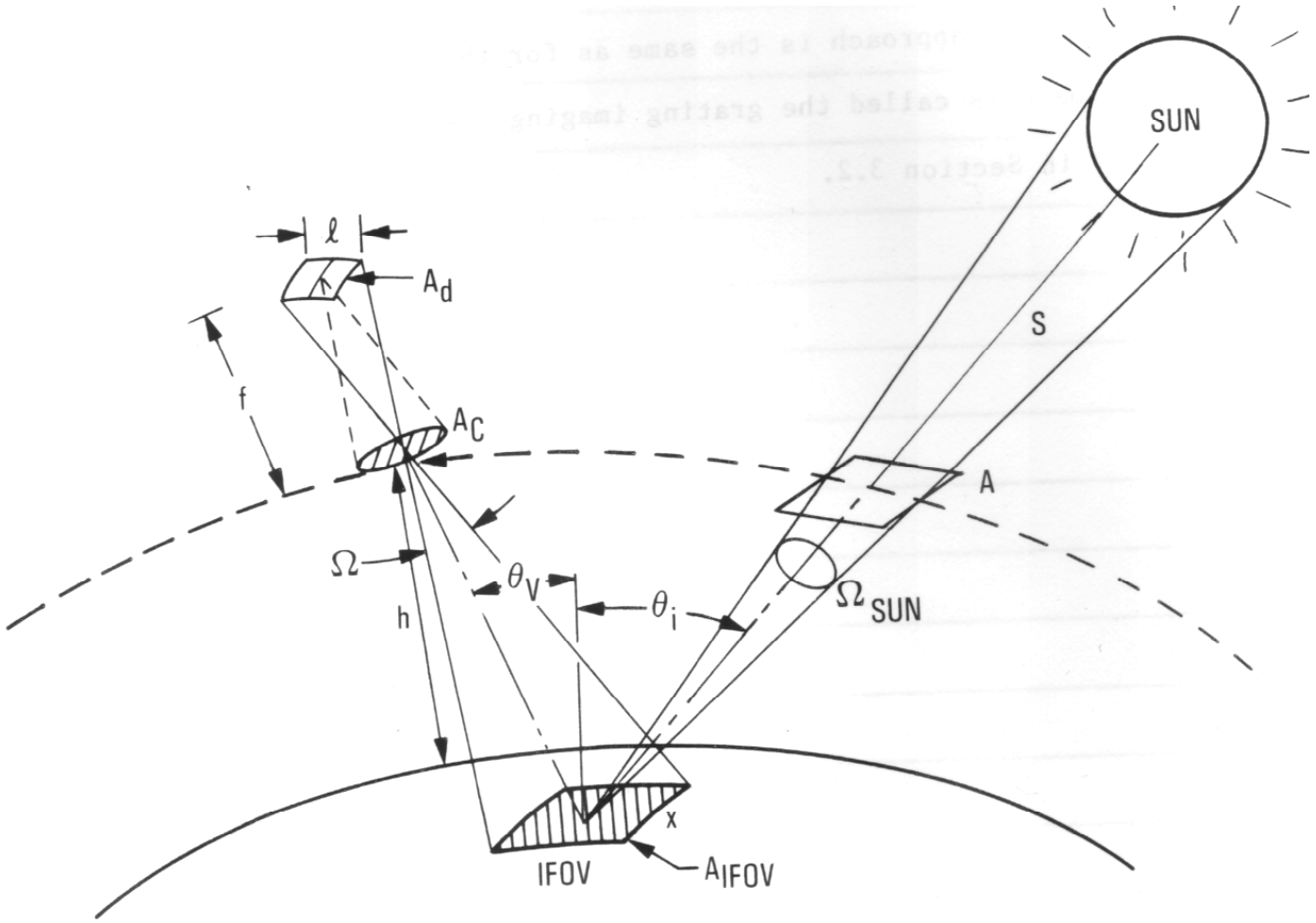
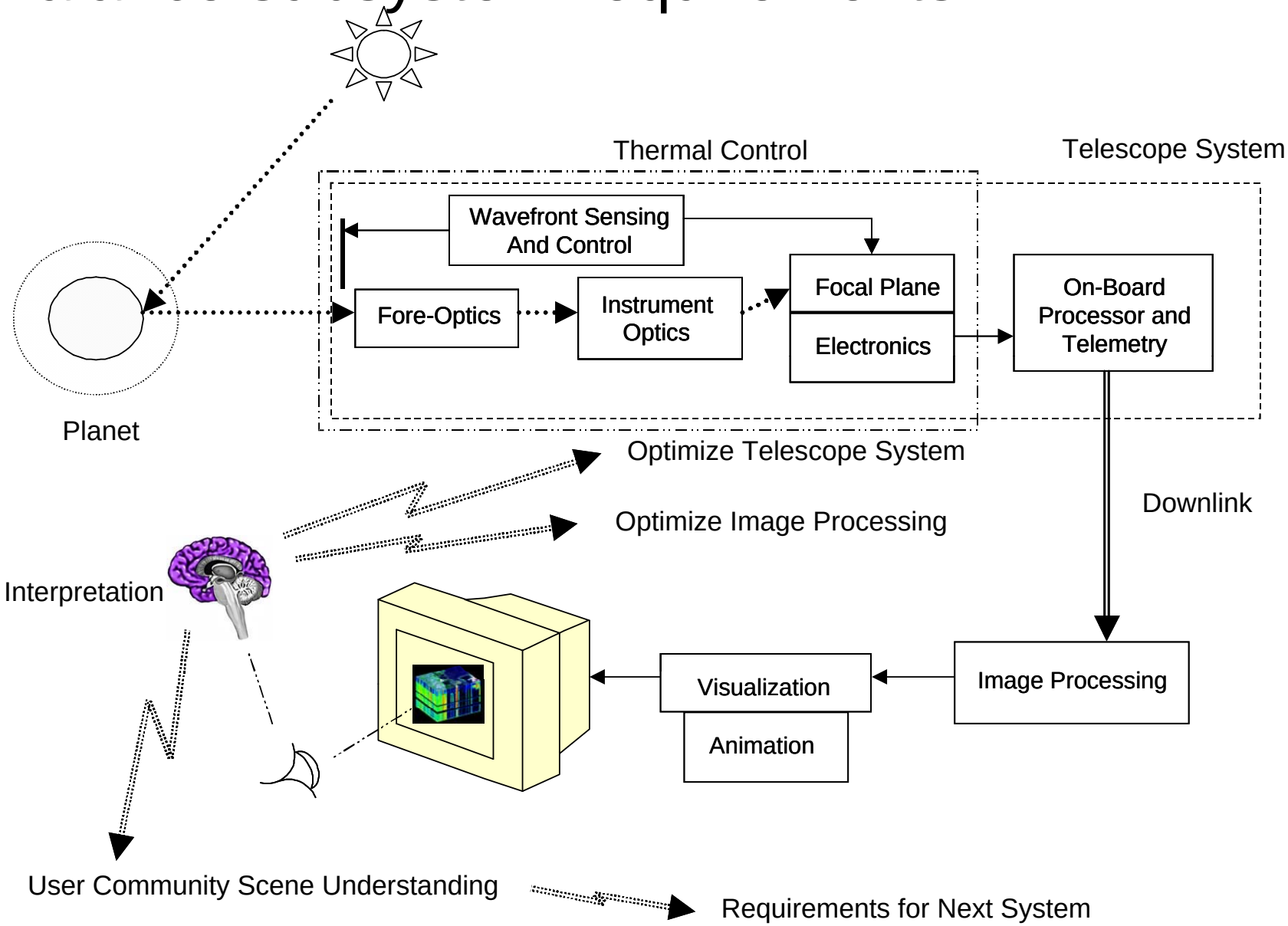
Optical system science & technology

Dr. J. Breckinridge
JPL/CALTECH
2008

Telescopes for Planetary Observations



Balance subsystem requirements



A successful space-optics system requires:

- Understanding of the measurement objective
- Physical optics of materials to control image quality & content: coatings, atmospheric propagation, scalar & vector diffraction, image formation and unwanted radiation control
- Mathematical optics: ray-trace design, vector & scalar diffraction analysis, tools to understand the performance of optical systems.
- Solid-state physics & electronics: conversion of photons to electrons, detectors, packaging, low-noise amplifiers and electronics
- Mechanical and mechanisms engineering: optical metrology
- Wavefront sensing & control: sense and correct wavefront aberrations in telescope systems.
- Structures and dynamics: Active and passive damping.
- Radiative transfer & thermal engineering: coatings, heaters, thermal emission, mechanical coolers & cryogens
- Spacecraft engineering - contamination, pointing, tracking, power, communication
- Software processing of images, automatic pattern recognition, information theory, and psychology of vision.
- End-to-end optical system characterization, verification, validation & calibration

Large aperture visions for optical/IR science

- 10 meter
  - 20μ diffraction limited 10^{o}K (L2)
  - <400nm diffraction limited 300^{o}K (GEO & L2?)
- 10 meter,
  - 400nm Diffraction limited
  - 1 angstrom rms
  - Control unwanted radiation to <1x10^{-12} @~3 Airy diffraction rings
- >100 meter sparse aperture
  - Free flying reconfigurable segments in a telescope
- Optics for harsh environments (Radiation & Thermal)