Optical system science & technology

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Telescopes for Planetary Observations
Balance subsystem requirements

Thermal Control

Wavefront Sensing And Control

Focals Plane Electronics

On-Board Processor and Telemetry

Optimize Telescope System

Optimize Image Processing

User Community Scene Understanding

Interpretation

Visualization

Animation

Image Processing

Downlink

Requirements for Next System
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
  - $20\mu$ diffraction limited $10^\circ\text{K}$ (L2)
  - $<400\text{nm}$ diffraction limited $300^\circ\text{K}$ (GEO & L2?)
- 10 meter,
  - 400nm Diffraction limited
  - 1 angstrom rms
  - Control unwanted radiation to $<1\times10^{-12} @~3$ Airy diffraction rings
- $>100$ meter sparse aperture
  - Free flying reconfigurable segments in a telescope
- Optics for harsh environments (Radiation & Thermal)