Discovery Channel Telescope

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Lowell Observatory

DCT Background and Progress

1995 Next Generation Lowell Telescope (NGLT) under consideration
- Initial optical studies & site testing

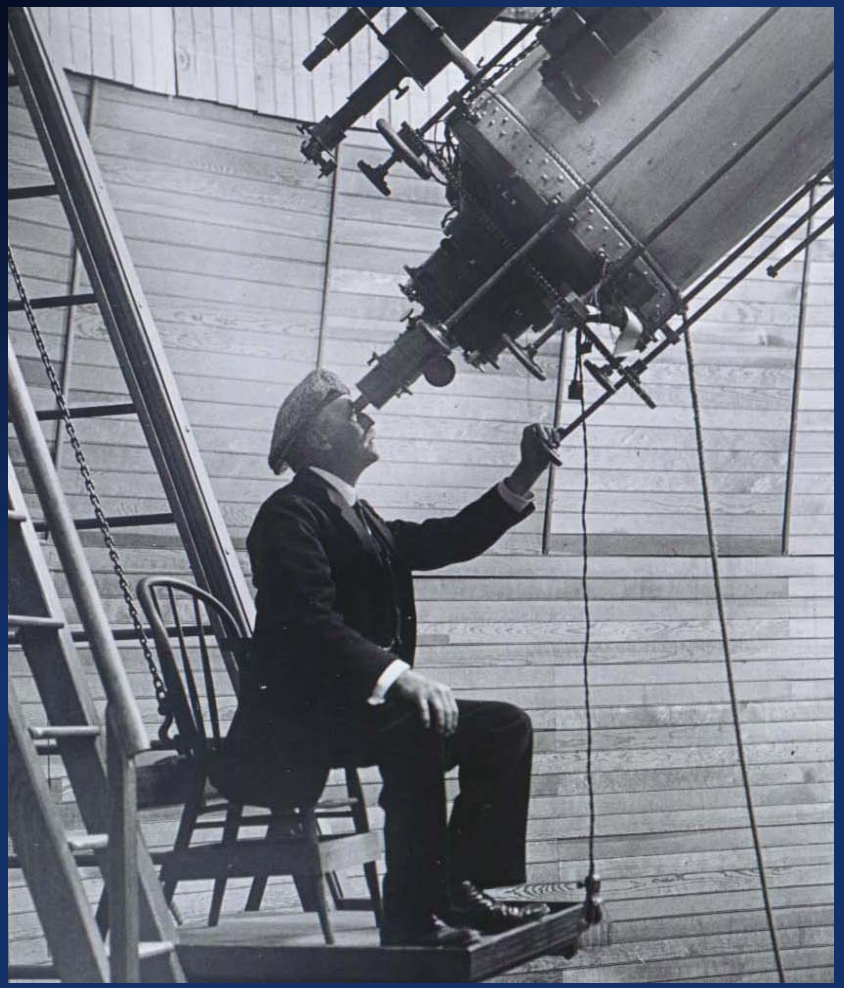
2003 Lowell-DCI partnership formed
- NGLT becomes DCT
- Project office established and staffed
- Mirror blanks ordered

2004 Concept Design Review
- Review overall design
- Reduce cost and risk, but retain capability

2004 Site development begun
- USFS use permit issued
- Access road and site preparation
- Formal groundbreaking

2005 Facility construction started
- Foundations and structural steel
- Shell and interior

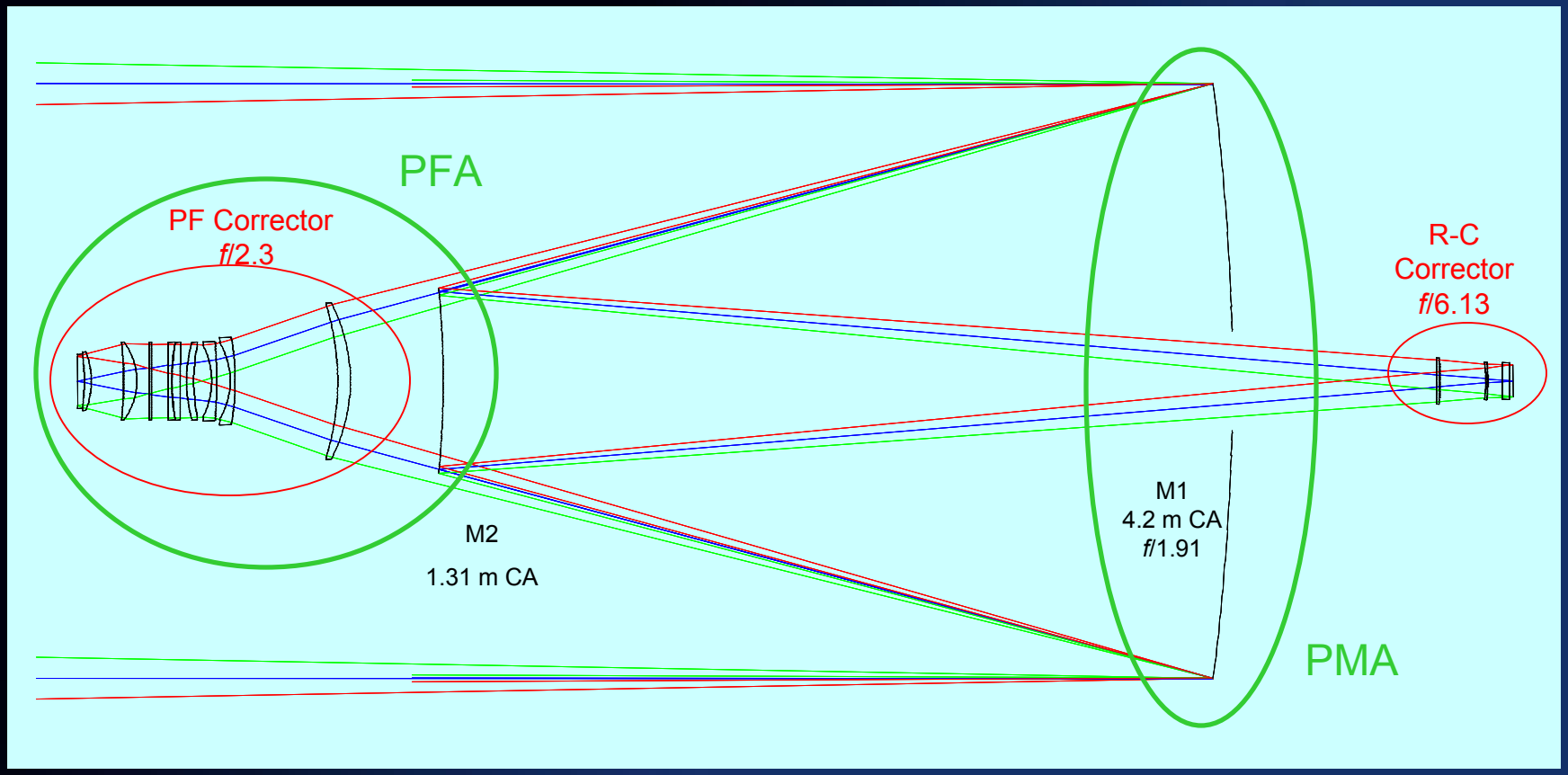
2005 Primary mirror blank completed
2006 Primary mirror figuring started
Base facility completion



Optical Specifications

Parameter	Prime Focus	Ritchey-Chrétien Focus
Clear Aperture	4.2 meters	4.2 meters
Effective f/ratio	2.3	6.1
Central obscuration	11%	13%
Linear Field of View	2 degrees	30' unvignetted
Image scale (15 μ pixel)	0.32 "/pixel	0.12 "/pixel
Image Quality	0.38" FWHM	0.29" FWHM
ADC	Included	Optionally removable
UV cutoff	360 nm	300 nm (without ADC)

Optical Configuration



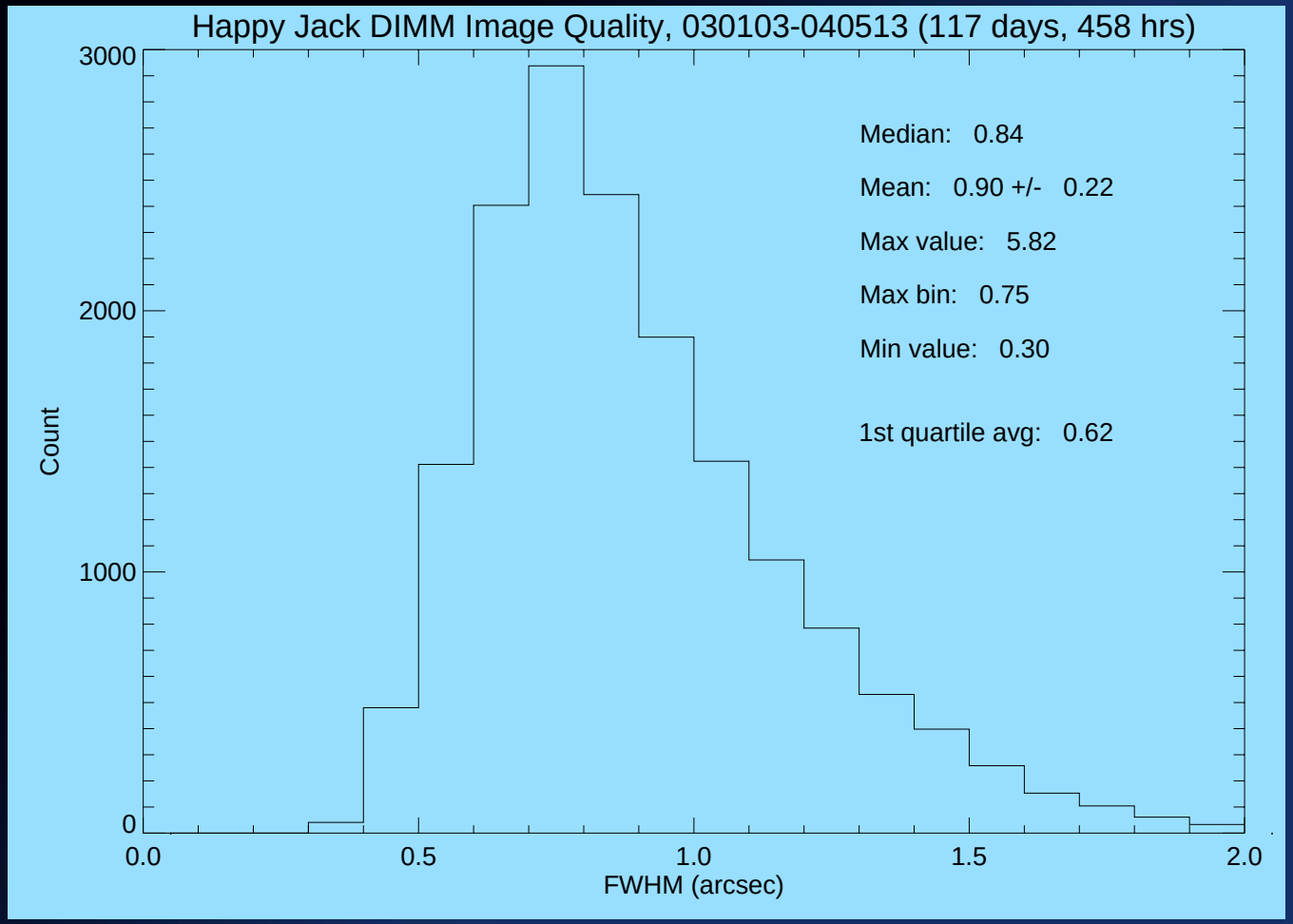
Imaging Survey Telescopes

Telescope	Diameter	Collecting Area	Solid Angle FOV	AΩ	First Light
	(m)	(m^2)	(deg^2)	($m^2 deg^2$)	
WIYN/One Degree Imager	3.50	9.6	1.0	9.6	2009
CFHT/Megacam	3.6	10	1	10	
Subaru/Suprimecam	8	50.2	0.25	12.6	
Palomar/Quest	1.2	1.1	16.6	18.3	
Blanco/Dark Energy Camera	4.00	12.6	2.2	27.6	2009
MMT/one-degree camera	6.5	33.2	1	33.2	
Lowell/DCT	4.20	13.9	3.1	42.9	~2010
Pan-STARRS	4x1.8	10.2	7.0	71.3	2007+
Subaru/Hyper-Suprime	8.20	52.8	2.5	132.0	~2009
LSST	8.40	55.4	10.0	554.2	~2012

Mechanical Specifications

Parameter	Specification
Operating azimuth range	± 270°
Operating zenith angle range	0.4° < Z < 85°
Maximum slew rate	3°/sec
Retargeting Time	< 6 sec for 2° move
Pointing error	< 2" rms
Pointing stability	< 0.1" jitter w/ 0.1"/min drift
Non-sidereal object track rates	> 5"/sec
Guiders	Non-sidereal capability
Prime/RC focus selection	Interchangeable top end
Nominal RC focus payload	1500kg Cassegrain 3000kg x2 Nasmyth 200kg x4 Bent-Cass

Happy Jack Site: Image Quality



Facility Construction

Site Work Completed June 2005
- Access road & telescope site preparation

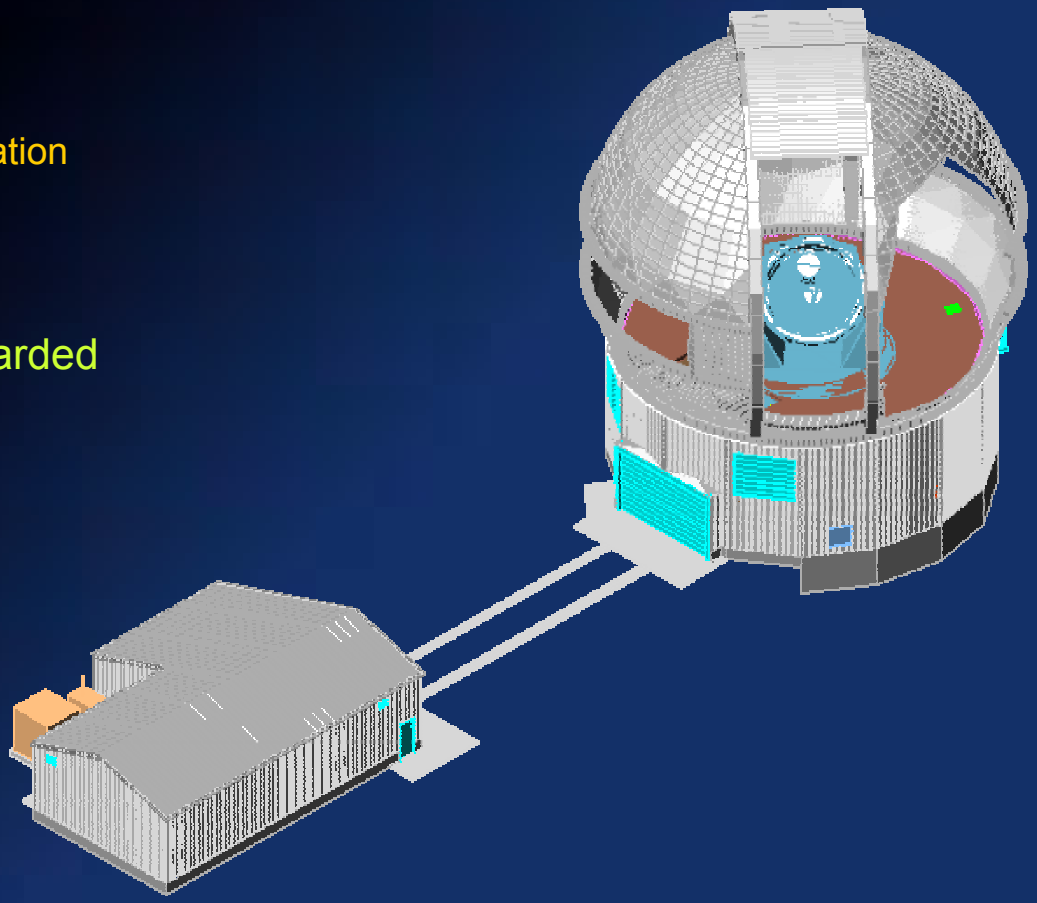
Formal Groundbreaking July 12, 2005

Concrete, Steel, & Metal Bldg contract awarded August 2005
- Foundations & structural steel
- Complete metal building shell
- Currently near completion

Trenching contract awarded Sept 2005
- Power and communication conduits
- Completed January 2006

Completion contract awarded May 2006
- Complete telescope building shell
- Install plumbing, mechanical, & electrical

USFS Shop Building contract awarded June 2006




BLEEKER'S
BOXES
526 1455

DCT Facility, September 2006

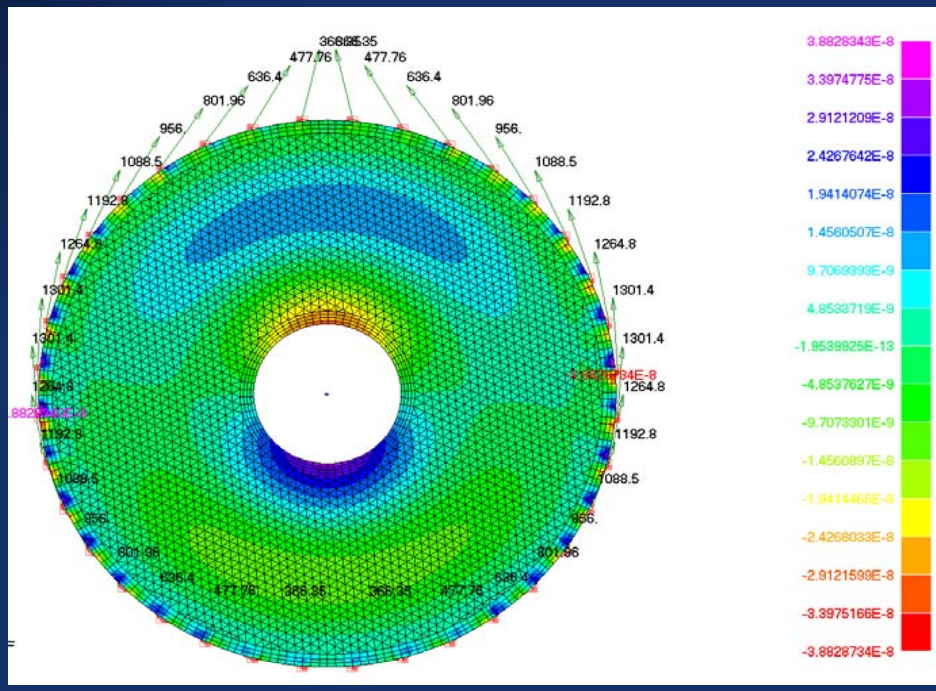

LOWELL
Discovery
CHANNEL
TELESCOPE

DCT Primary Mirror Blank: 4.3m ULE

Primary Mirror Blank
Final Figuring and Polishing

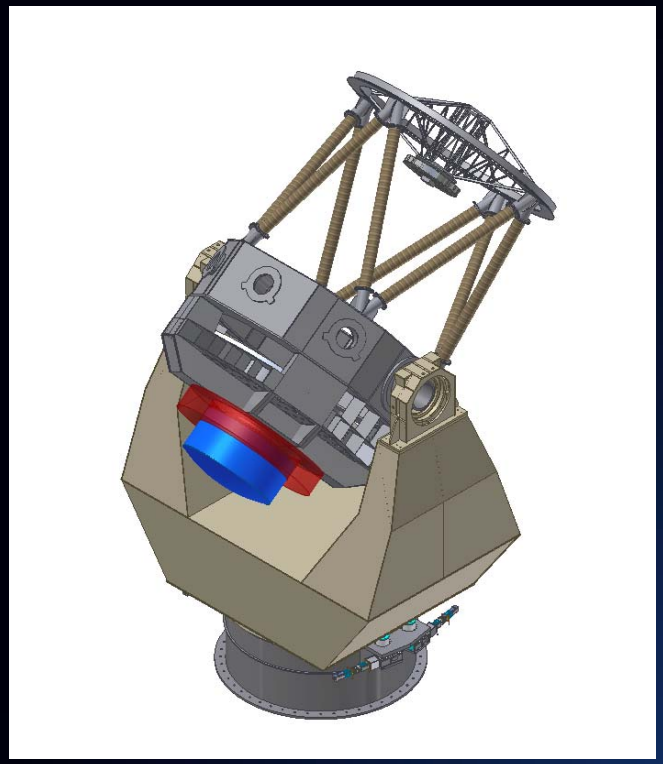
- Awarded to University of Arizona, Optical Sciences Center
  Contract interval: August 2006 – August 2009

- Active optics system development integral to this effort: 120 axial, 36 lateral, 3 tangential supports. Active optics control can be tested in polishing support and test fixture.



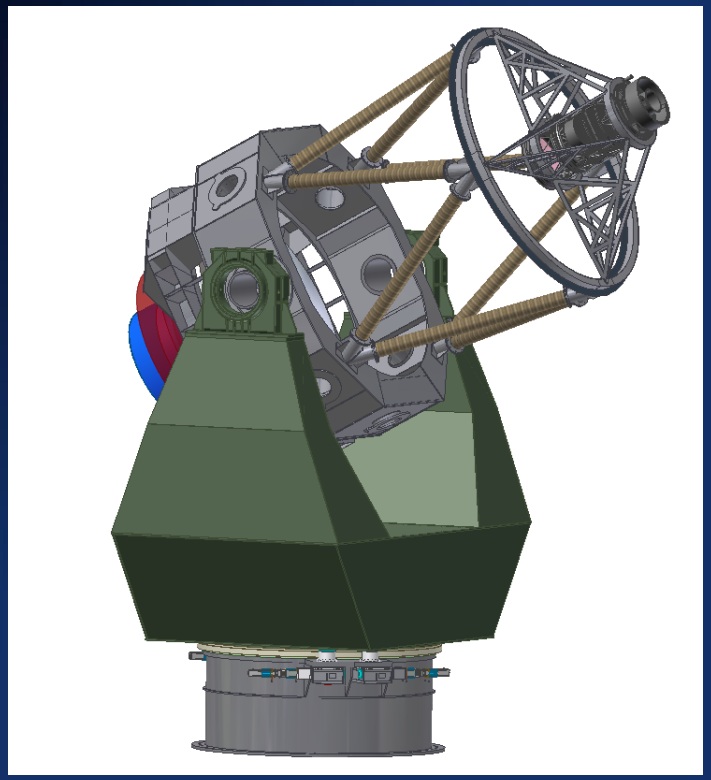
DCT Mount Development

RC Configuration



- Secondary mirror on lightweight support, improving obscuration and infrared contrast.
- Support for Nasmyth and Bent-Cass instrumentation

Prime Focus Configuration



- RC and PFA top ends are interchangeable, swapped with dome crane in day shift
- Phase II (pre-PDR) study complete

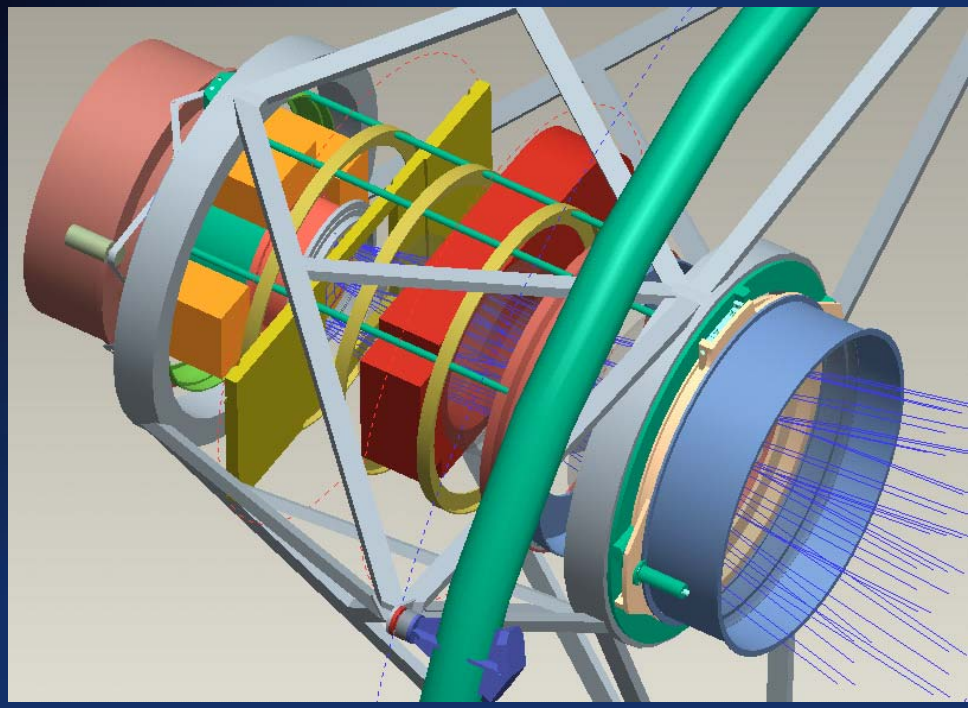
Prime Focus Assembly

Phase II study at Goodrich EOS, 2005:

- Eliminate tumbling top-end design

- Relax optical requirements
  - Median image quality was 0.89”, is 0.92”
  - U-band requirement relaxed
  - Allows better selection of lens materials

- Design results
  - Meets image quality requirements, with 5 rather than 7 elements, and 2 fewer aspherical surfaces
  - ADC is now tip-tilt of single element
  - Retains UV performance
  - Improved throughput
  - Allows conventional shutter
  - Rotating filters
  - Reduced cost ~$2M



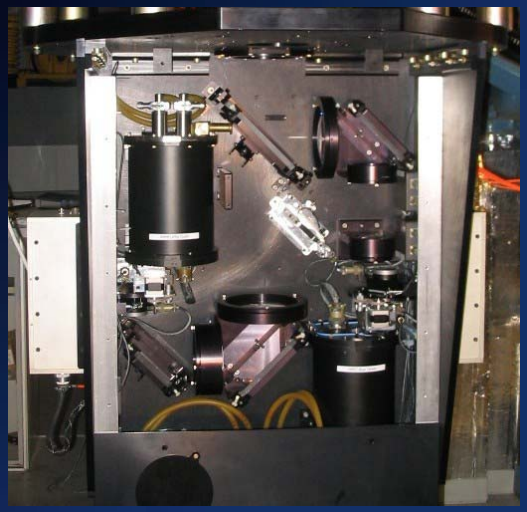
Lowell Instrumentation Facilities

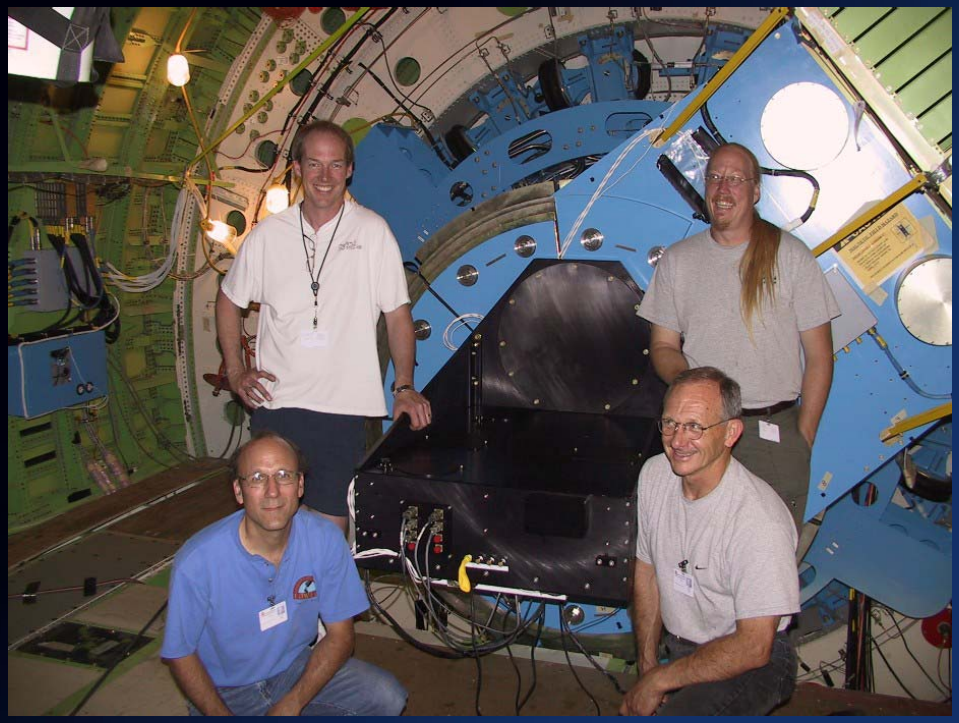
- Laboratory and machine shop facilities: 4000 sq ft
- 3-axis CNC mill, lathes, wood and welding shops
- Class 10000 clean room for detector and optical work
- LOIS: Lowell Observatory Instrumentation System

Lowell Instrumentation Development

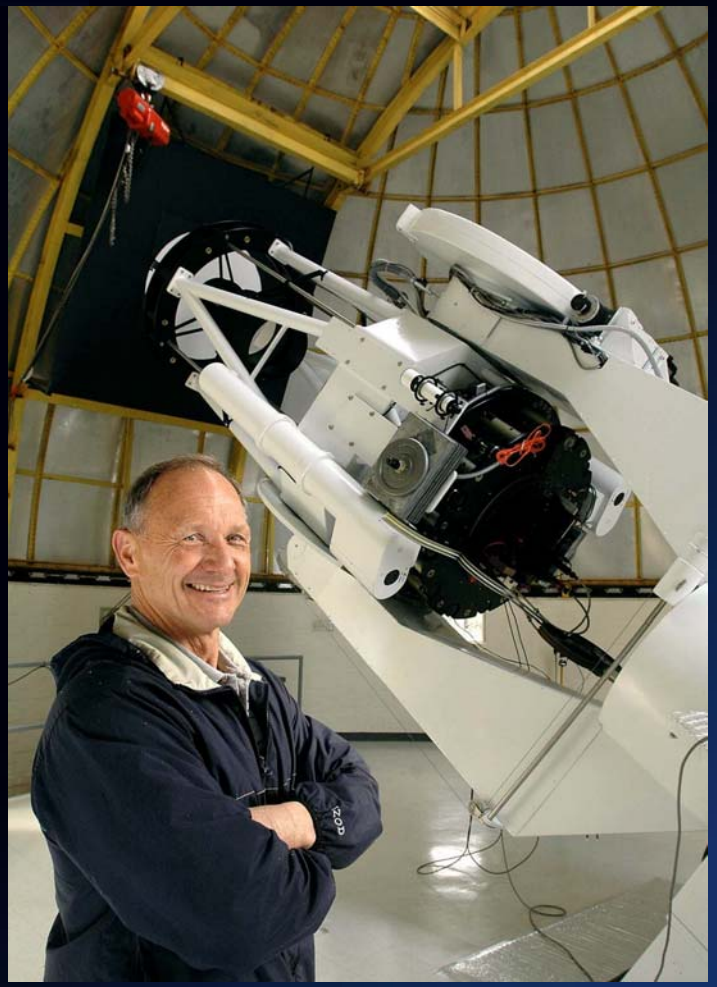
HIPO: High-speed Imaging Photometer for Occultations, SOFIA 1st-light instrument.

PI: Ted Dunham

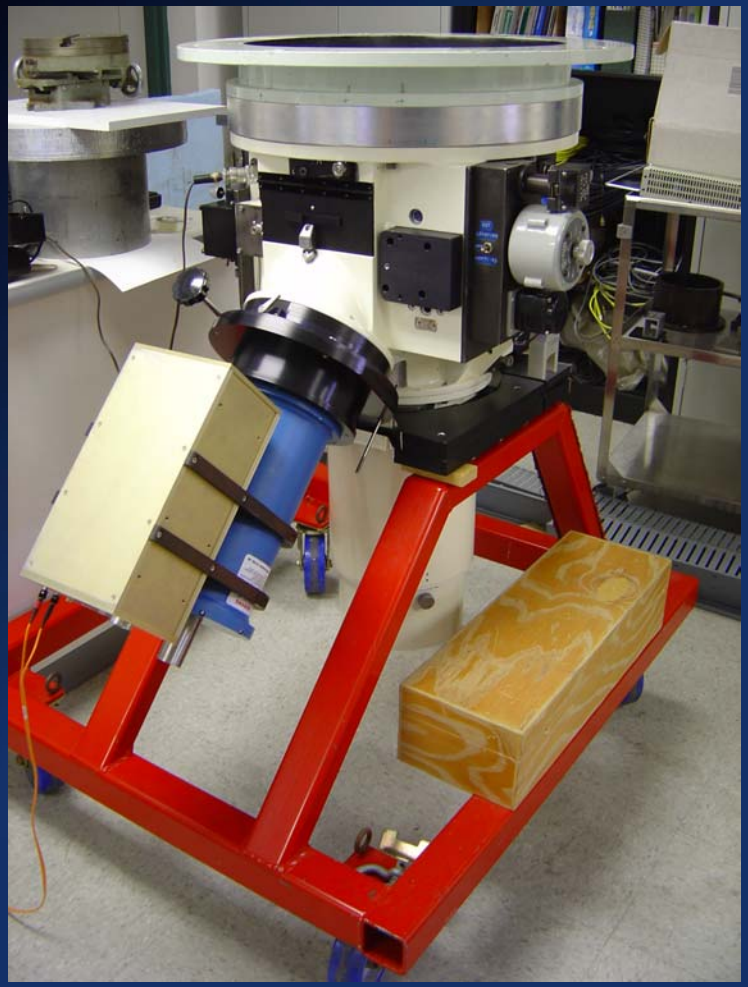




Lowell Instrumentation Development

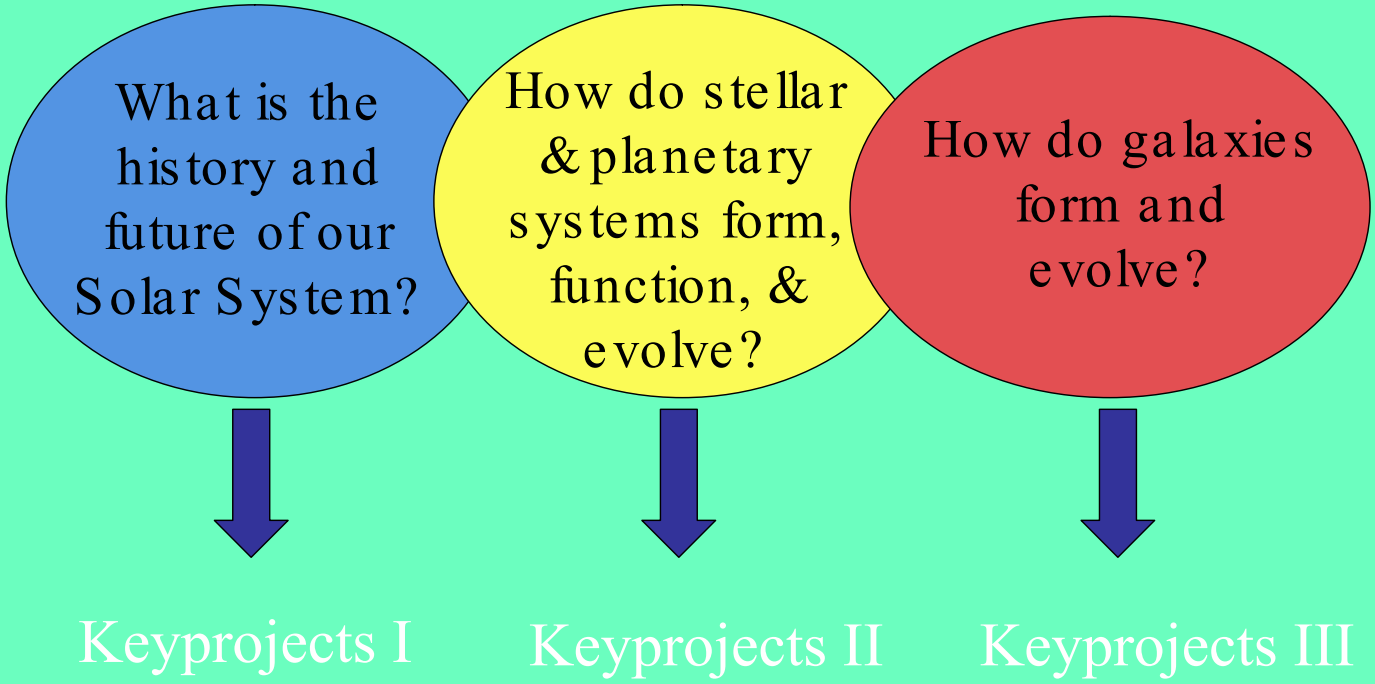


42” Hall Telescope



DeVeny Spectrograph

The DCT Science Mission



DCT Instrumentation

Instrumentation Plan Enables Key Projects in the DCT Science Mission

- RC Configuration at First Light:
  - High-resolution 8k x 8k CCD camera
  - DeVeny low-resolution optical spectrograph
- 2nd Development Phase:
  - Wide-field prime focus capability
- 3rd Development Phase:
  - Implement Nasmyth focal stations
  - High-resolution optical spectrograph