CTIO/SMARTS
Data Acquisition

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Cerro Tololo InterAmerican Observatory

Location: 30° 10' S 70° 48' W
Altitude: 2200 m

Operated by NOAO for the US National Science Foundation

Telescopes:
- 4m Blanco
- 1.5m
- 1.3m (ex-2MASS)
- Yale 1.0m
- 0.9m
- many smaller telescopes…


4m Blanco
0.61m Curtis Schmidt
Yale 1.0m
CTIO 1.5m
CTIO 0.9m

CTIO 1.3m Telescope

CTIO Site Characteristics

300+ clear nights/year

Median 0.8” seeing

1.3m Telescope

- Median 1”
- As good as 0.7”

1.0m Telescope

- Median 1.2”
- As good as 1.0”

SMARTS
Small and Moderate Aperture Research Telescope System

Consortium to operate the small telescopes at CTIO since 2003

Members:

Yale, Ohio State, Georgia State, Sejong, NOAO, Vanderbilt, Stony Brook, STScI, Delaware, Fisk

Operations:

Yale & CTIO

Instruments: CTIO & Ohio State

ANDICAM:
A Novel Dual Imaging CAMera

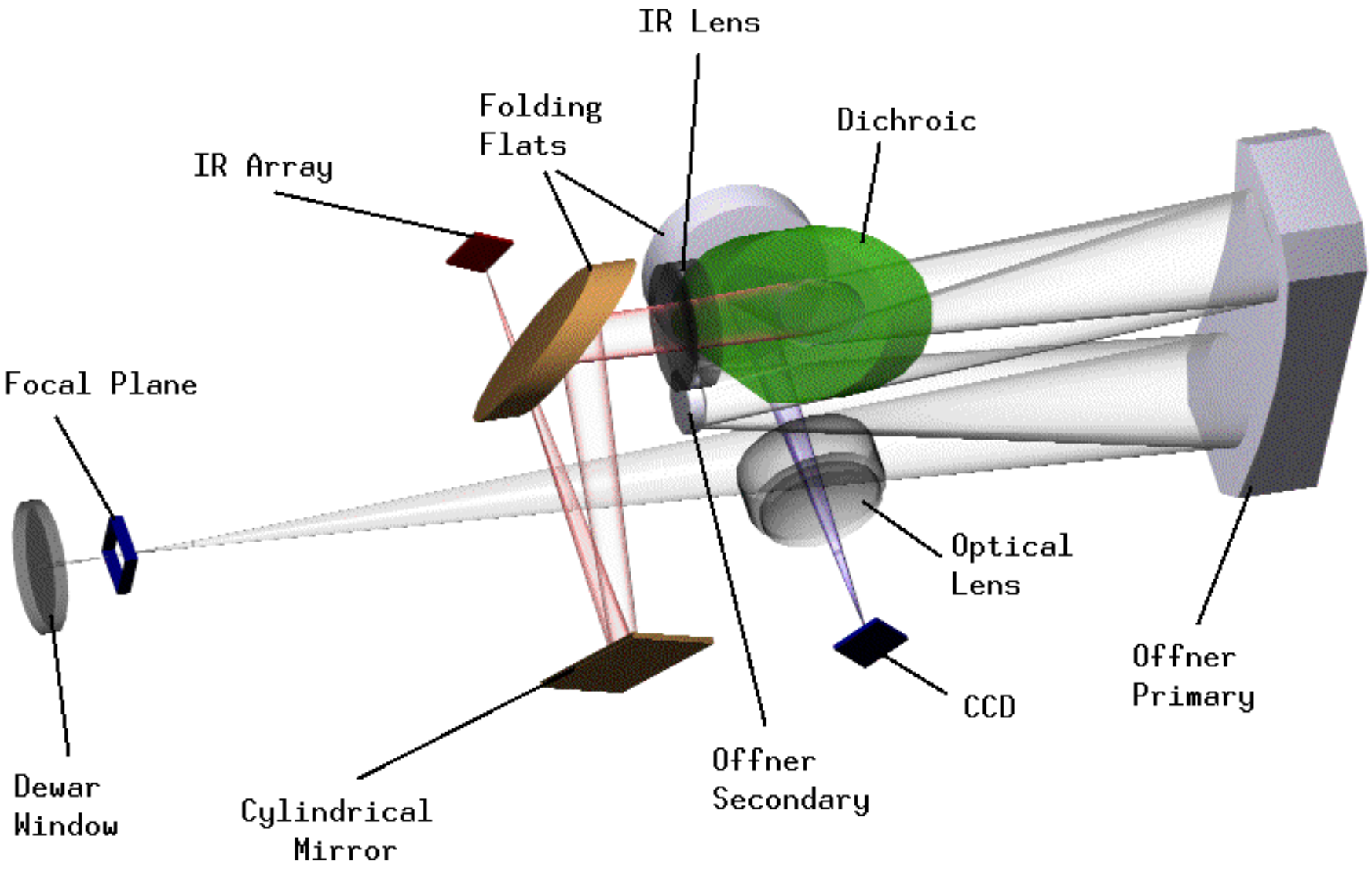
MicroFUN asset on the CTIO 1.3m Telescope

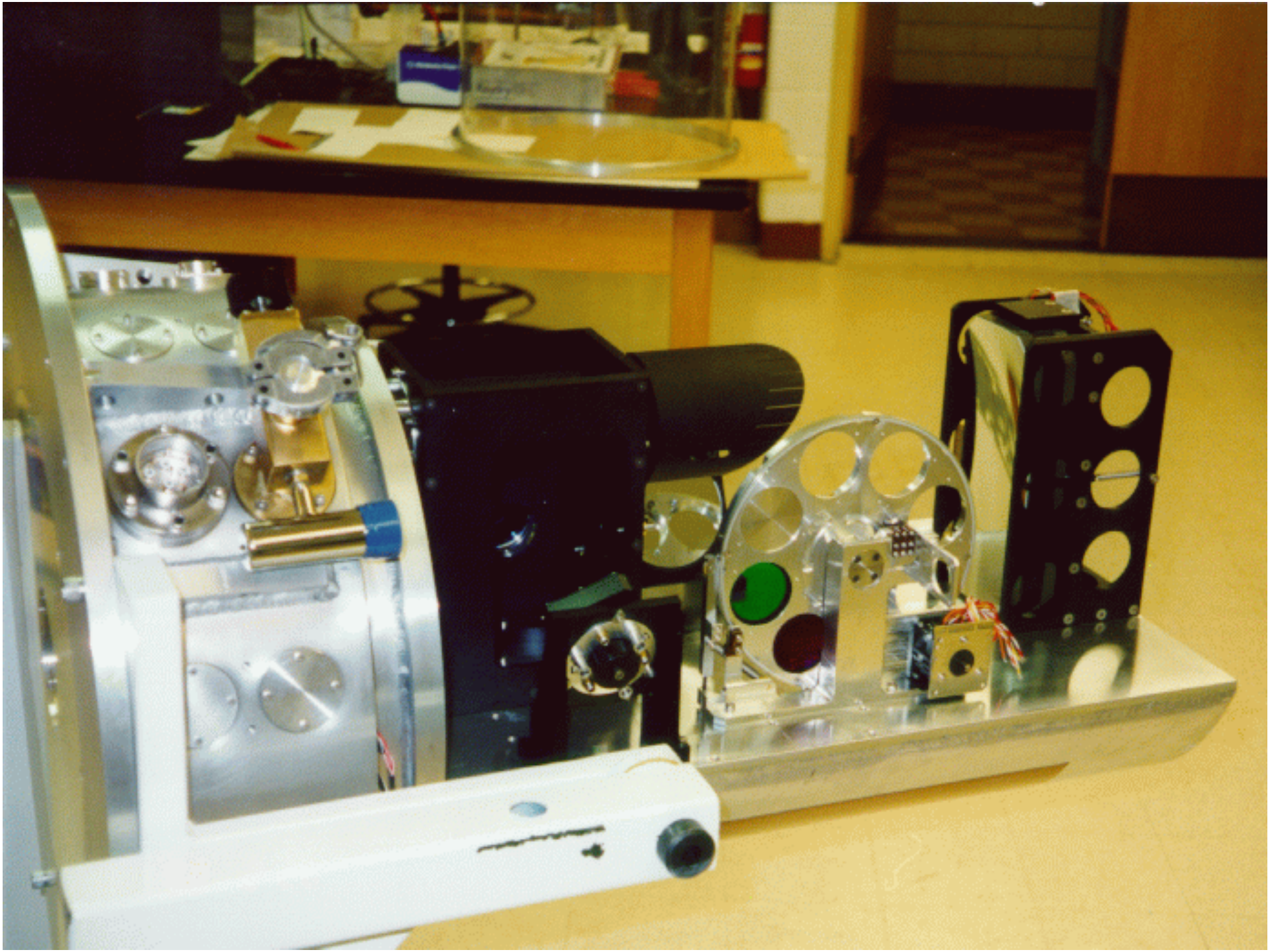
Dual Optical/IR Camera

- 2K CCD Detector: UBVRI
- 1K HgCdTe IR Array: YJHK

Built by Ohio State in 1998 for the YALO 1m

ANDICAM Optical Path





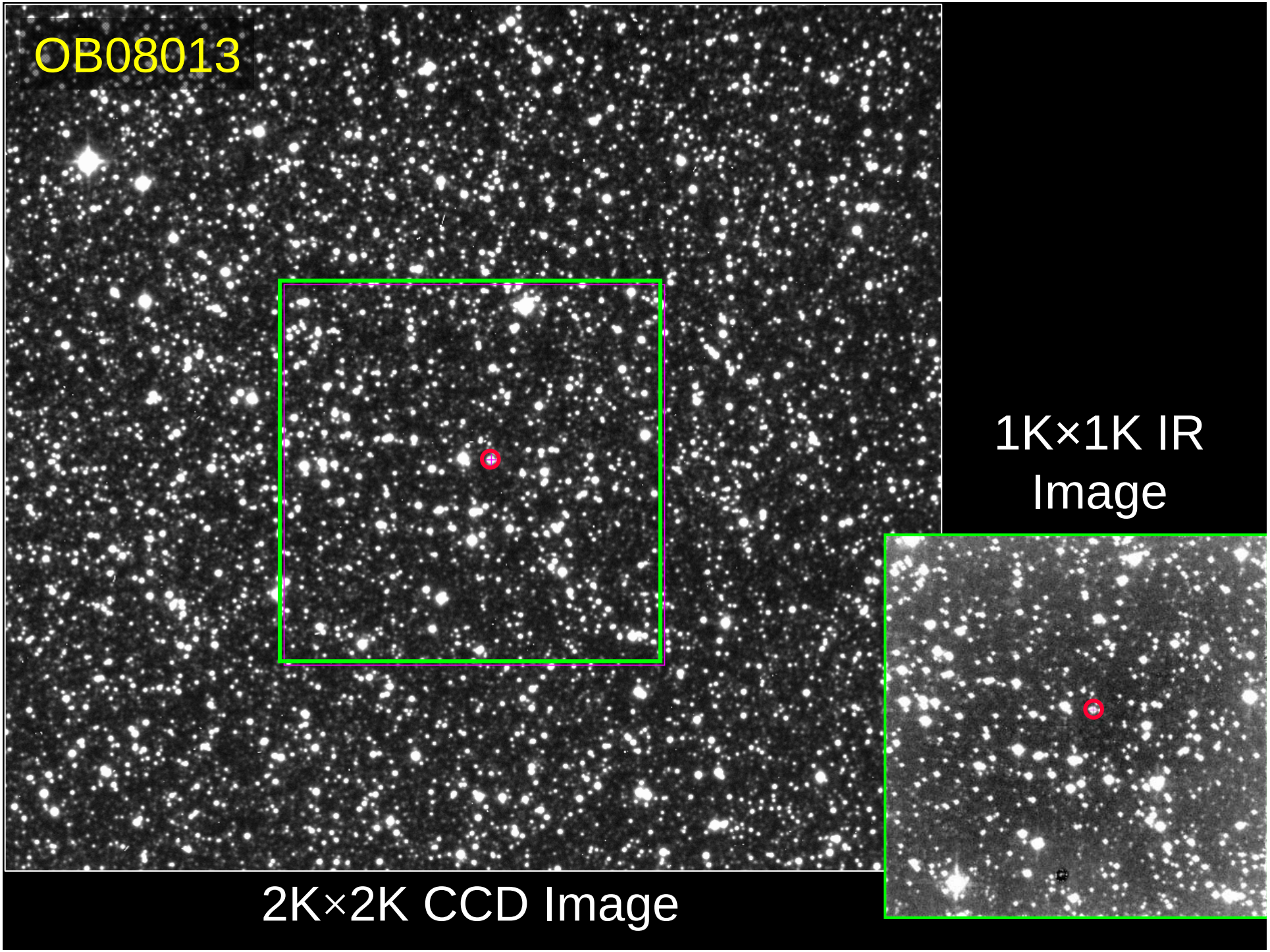
Camera Characteristics

CCD Channel

- Fairchild 447 2K×2K CCD, 15μm pixels
- 6×6’ FOV binned 2×2 to 0.369”/pixel
- 47sec readout

IR Channel

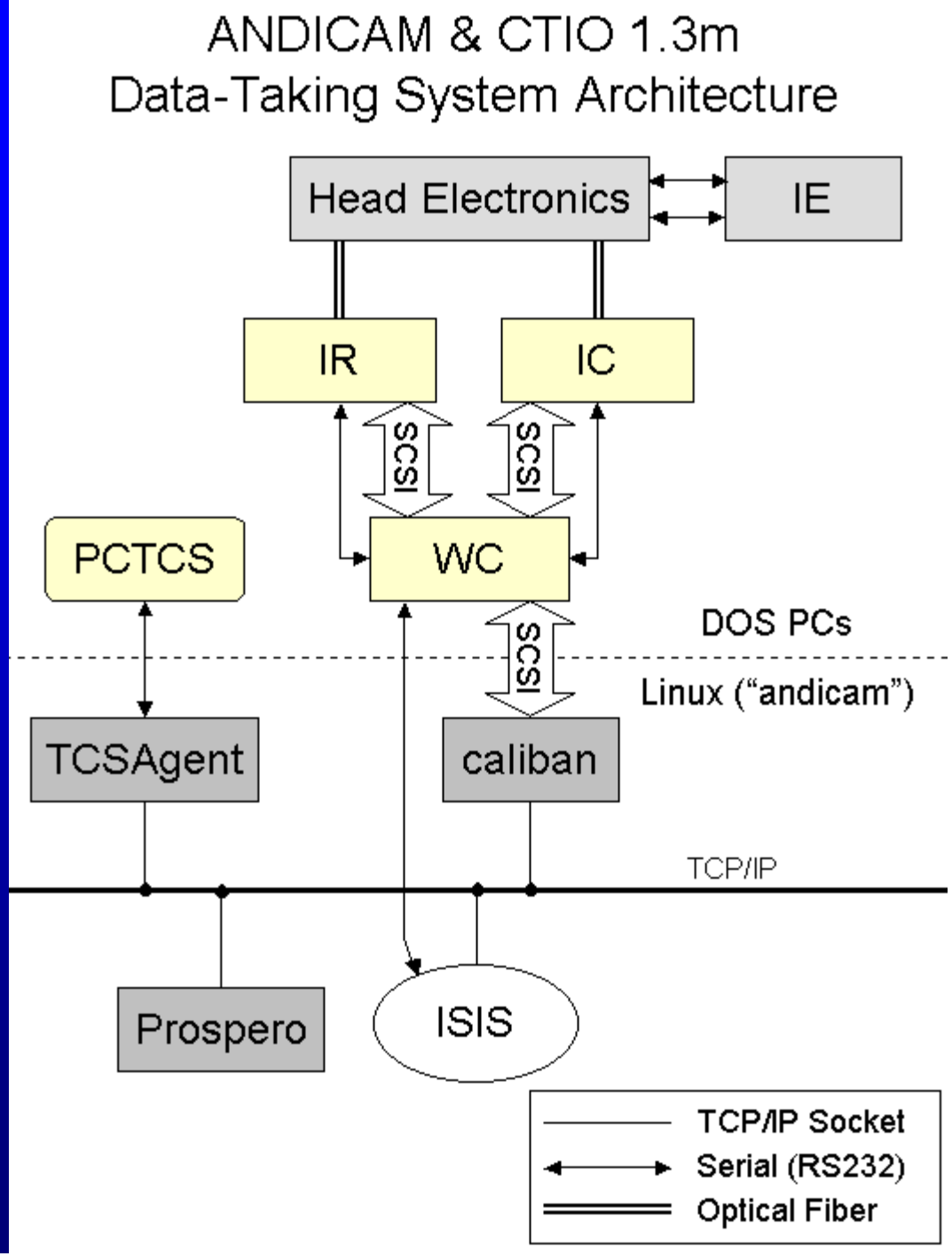
- Rockwell HAWAII-2R 1K×1K HgCdTe Array
- 18μm pixels
- 2.4×2.4’ FOV binned 2×2 to 0.274”/pixel
- 4sec readout time


OB08013
1K×1K IR Image
2K×2K CCD Image

Command & Control

- Linux workstation for data-acquisition & instrument control
- DOS PCs for detector control
- Win3 PC for telescope control

Custom software developed at OSU



ANDICAM Operations

Queue scheduled telescope

- Web-based submission form
- Yale compiles a nightly queue
- Executed by two Chilean observers on 1-week rotation

Data Uploaded to Yale/SMARTS

- Basic image reduction pipeline
- FTP image repository
- Auto-logging & email notification
- Photometric calibration

Charles Bailyn

Michelle Buxton

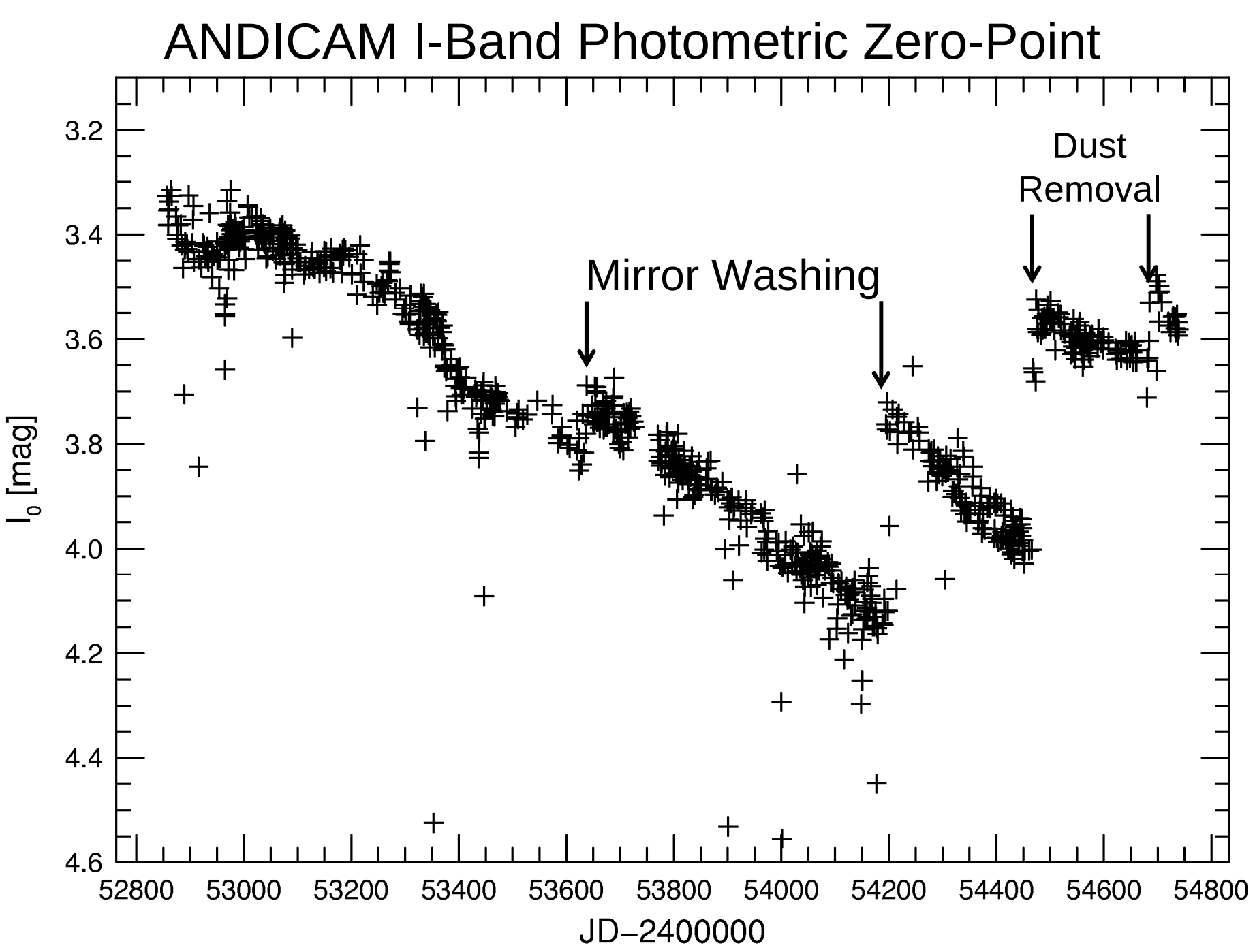
Suzanne Tourtellotte

ANDICAM Observers in Chile

Juan Espinoza

Alberto Miranda

David Gonzales
(until 2006)


ANDICAM I-Band Photometric Zero-Point
Dust
Removal
Mirror Washing
I_0 [mag]
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
52800
53000
53200
53400
53600
53800
54000
54200
54400
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MicroFUN Observations

CCD in V & I

- Expose for 120-300sec
- 1 V for every 5-10 I depending on need

IR in H (1.6μm)

- 5 – 6 exposures (20-60sec each)
- Dither ~10” between IR images with an internal tip/tilt Mirror

Optimize for same exec time in both channels

- Simultaneous CCD & IR imaging

MicroFUN Data Acquisition

Generate command files at Ohio State for new & on-going events (Gould, Gaudi, et al.)

- Upload into the Yale queue system
- Get in the nightly queue with all programs

Small number of emergency overrides:

- Can observe all night on high-mag events
- Use less time during slack periods to balance
- Real-time monitoring tested in 2008

Download images to Ohio & Korea for analysis

2009 Bulge Season Planning

Automatic on-site 2D reduction pipeline:

- Bias & Flat field data as soon as acquired
- Queue for immediate upload to Ohio State

Ohio Data Processing:

- Rapid photometric analysis for near-realtime monitoring of developing events
- Set out reduced data for retrieval by KASI for the difference-imaging pipeline as they arrive
- RSS feed for logging and notification

Operates autonomously…