

Telescope systems at Lick Observatory and Keck Observatory

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Time Scales, Reference Frames and Systems

- Everything has changed – FK4 -> FK5 -> IAU 2000
- Machines do all the computing
- Software implements the algorithms
- Need code libraries that know the conventions

Available Software

- Starlink Library for Astrometry (SLALIB)
 - FK4 and FK5
- IAU Standards of Fundamental Astronomy (SoFA)
 - FK5 and IAU 2000
- Naval Observatory Vector Astrometry Software (NOVAS)
 - IAU 2000
 - unencumbered

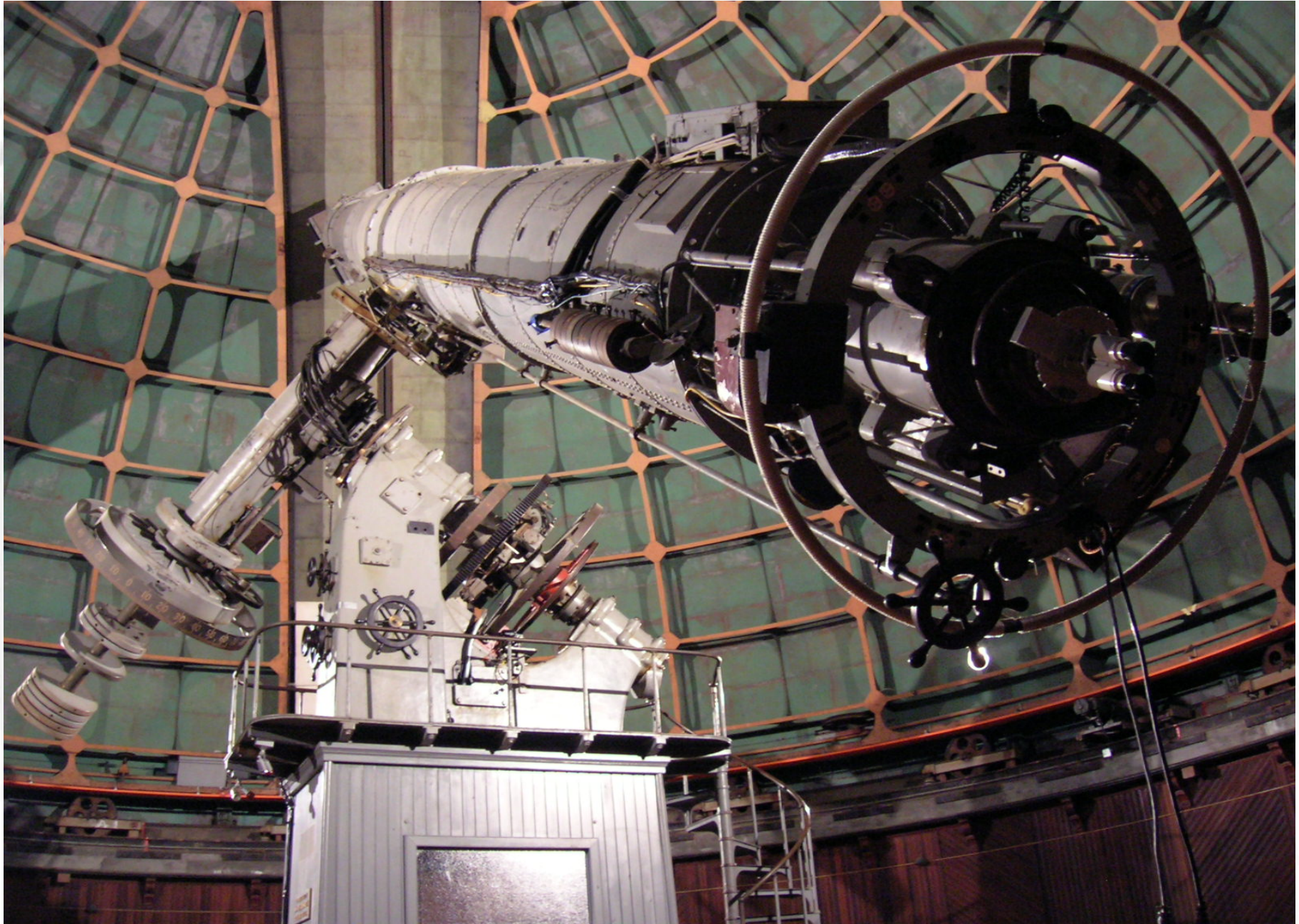
Pointing the telescopes

- Telescope inceptions span 125 years
- Absence of leap seconds affects each differently

Lick Observatory



James Lick 36-inch refractor



Lick refractor control panel





Shane 3-m reflector



Shane 3-m reflector



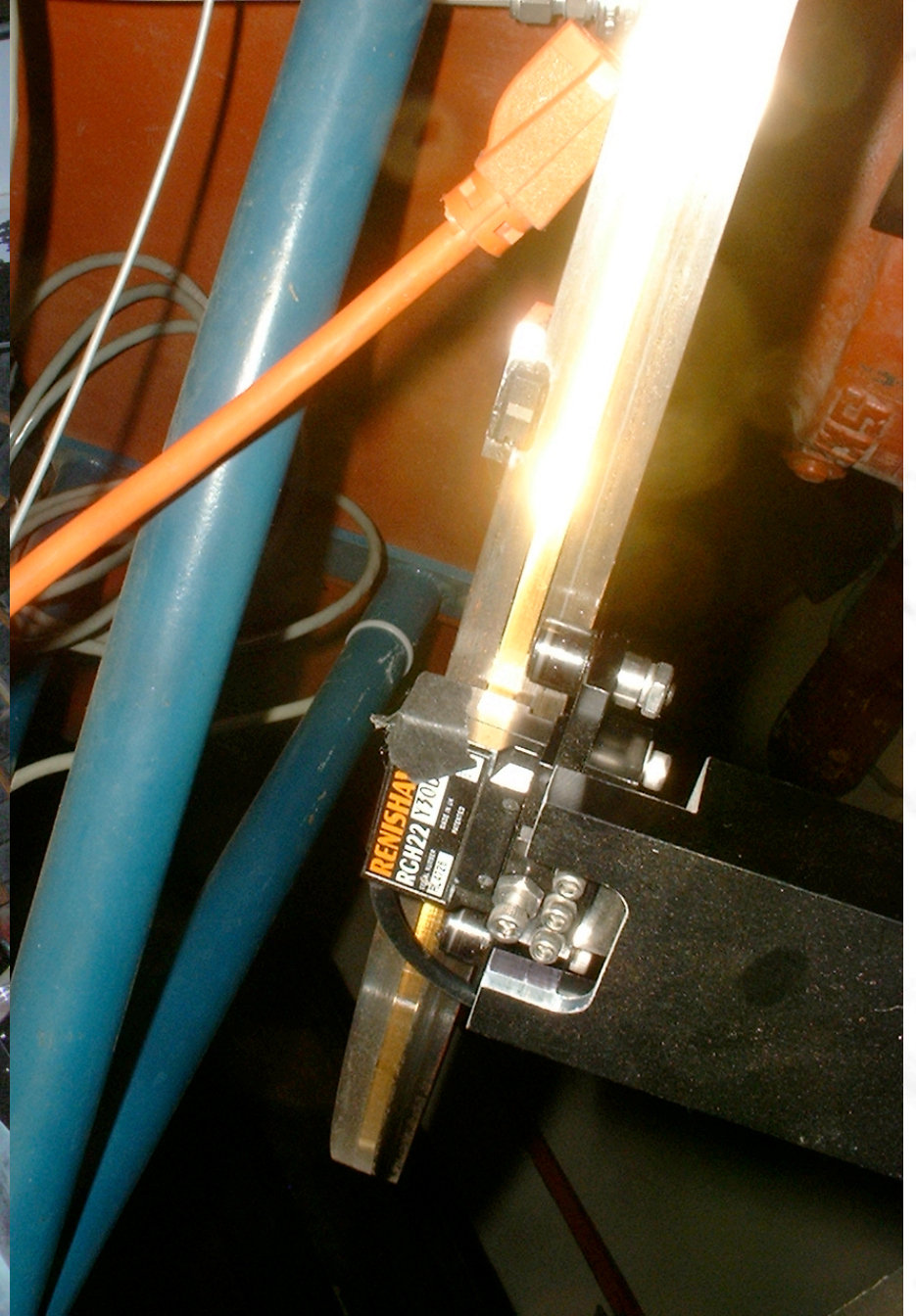
Original Shane control panel



New Shane control room



Nickel 1-m reflector



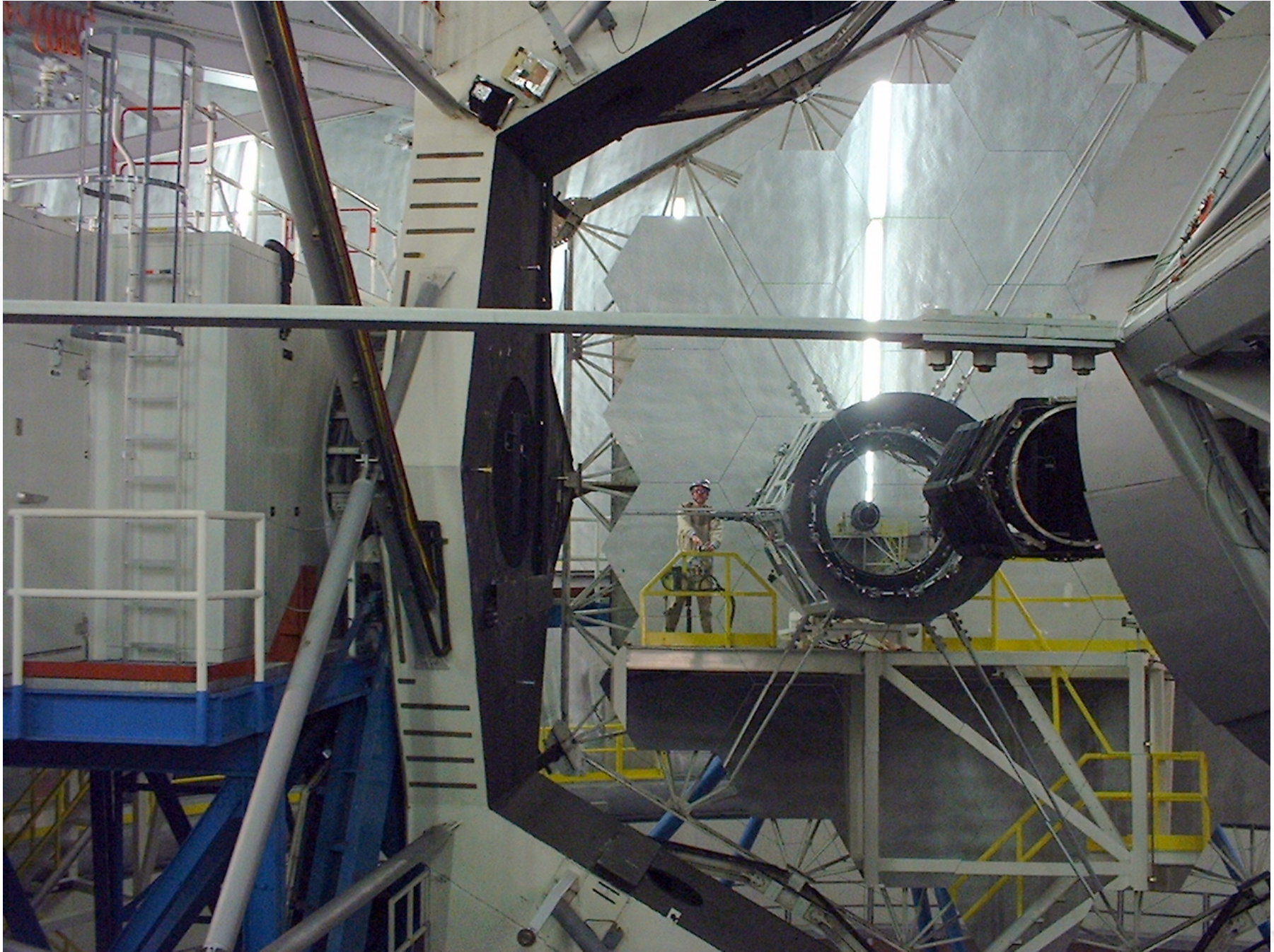
Shane and Nickel

- both are equatorial
- Shane guider FOV ~3 arcmin, Nickel ~7 arcmin
- Nickel original control via 6502 microprocessor & steppers
- Shane received another 6502 “TELCO” for guiding
- slews were manual for both
- TELCO replaced by Intel/Linux “POCO” around 2005
- POCO uses SLALIB
- POCO + new encoders on Nickel → automatic slewing
- both now allow remote observing via Internet
- TTs always on duty for Shane slews
- absence of leap seconds will affect Shane first

Keck 10-m reflectors



Keck 10-m primary



Keck 10-m control room



Keck 10-m reflectors

- segmented primaries in alt-azimuth mount
- guider FOVs ~ 3 to 3.5 arcmin
- typical blind slew accuracy ~ 7 to 8 arcsec
- occasional slews off by 40 arcsec \rightarrow nearby catalog star
- OAs always on duty for slews
- DCS uses SLALIB and GPS time server
- absence of leap seconds \rightarrow new pointing software soon

APF 2.4-m reflector



APF 2.4-m reflector

- monolithic primary in alt-azimuth mount
- dome and telescope purchased from vendor
- contract specification of 10 arcsec slew accuracy
- guider FOV < 3 arcmin
- intended for fully robotic operation
- time input from GPS receiver over serial line
- pointing software is closed source
- absence of leap seconds → failure to point

APF software

- never send a programmer to do an astrometrist's work

APF workaround

