ARC 3.5m Telescope
Apache Point Observatory

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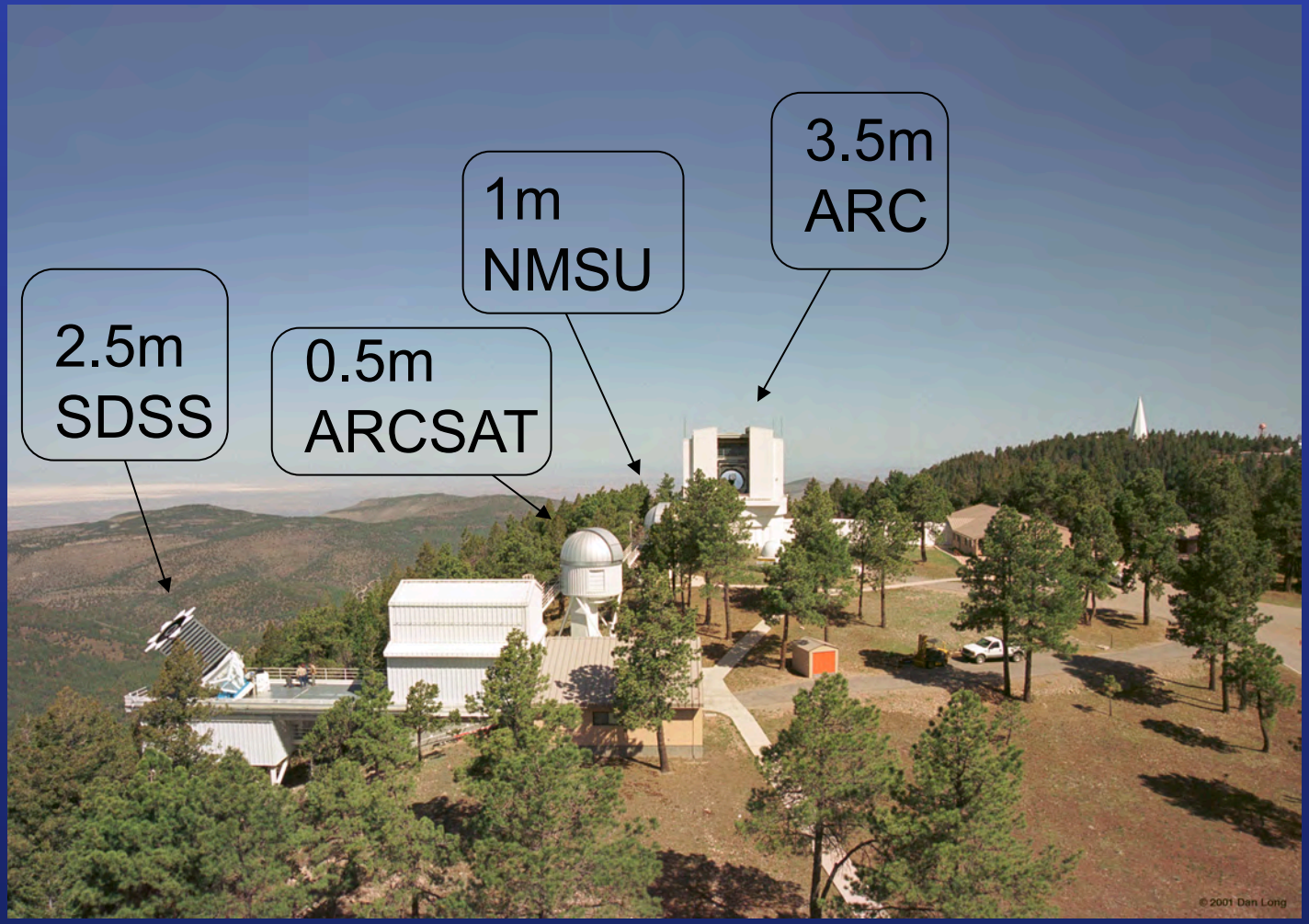
For more information: http://www.apo.nmsu.edu

Apache Point Observatory



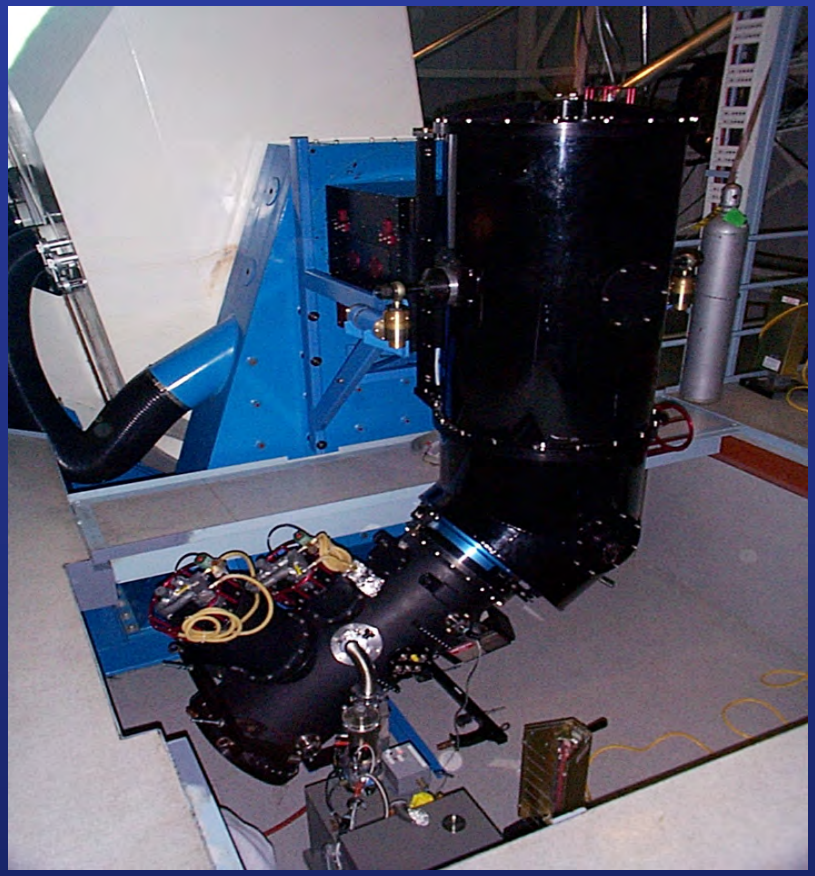
Astrophysical Research Consortium (ARC) Partner Institutions (2012)

- University of Washington (25.0%)
- University of Chicago (17.0%)
- Princeton University (15.6%)
- New Mexico State University (15.6%)
- University of Colorado (12.5%)
- Johns Hopkins University (8.0%)
- University of Virginia (6.3%)

ARC 3.5m Telescope

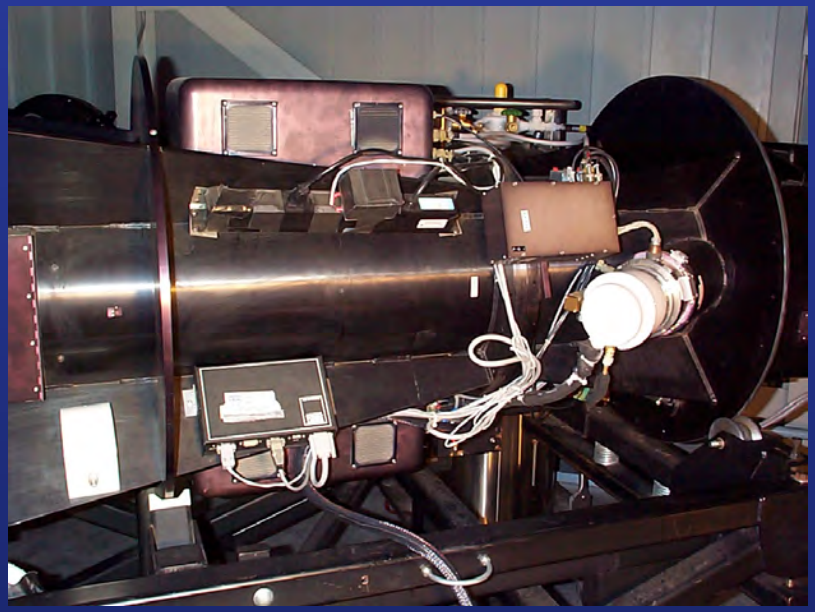
- 3.5m borosilicate primary mirror from Arizona Steward Observatory Mirror Lab
- Alt-az telescope mount, used mostly at f/10 Nasmyth ports, NA1 and NA2
- NA1 has permanently mounted echelle spectrograph
- NA2 has instrument rotator, several instruments (optical and near IR)
- Quick change capability (<15 min)
- Scheduled in half nights, 90% of observing is remote by University partners using TUI (Telescope User Interface) software

Echelle Spectrograph



- R = 30,000
- Full wavelength coverage from 3900-9800A
- V~15 in one hour (S/N=10)
- Single object

Dual Imaging Spectrograph (DIS)

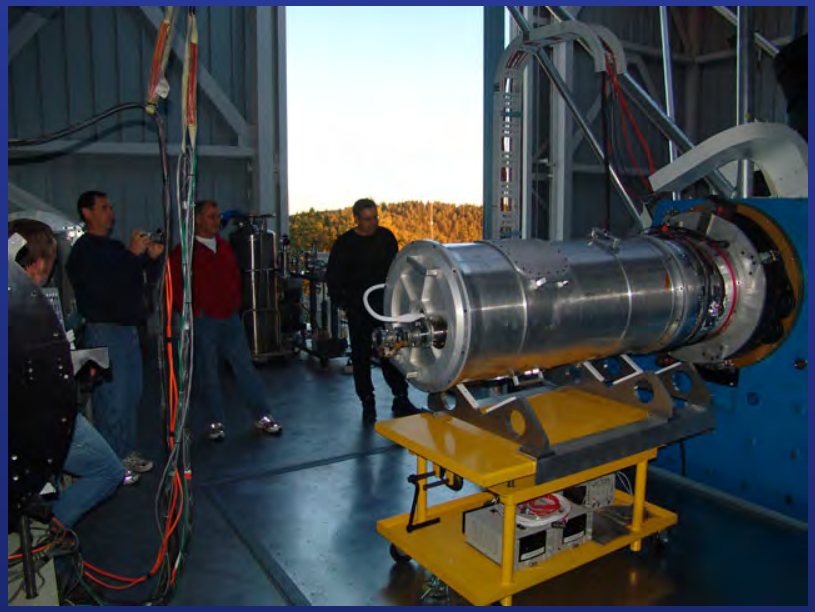


- Blue and red channels split by dichroic at 6000A, observe both simultaneously
- High (R=5000) and low (R=1000) resolution
- V~20 in one hour (S/N=10)
- Long slit (6’) and some multi-slit capability

Optical Imaging Camera (SPIcam)

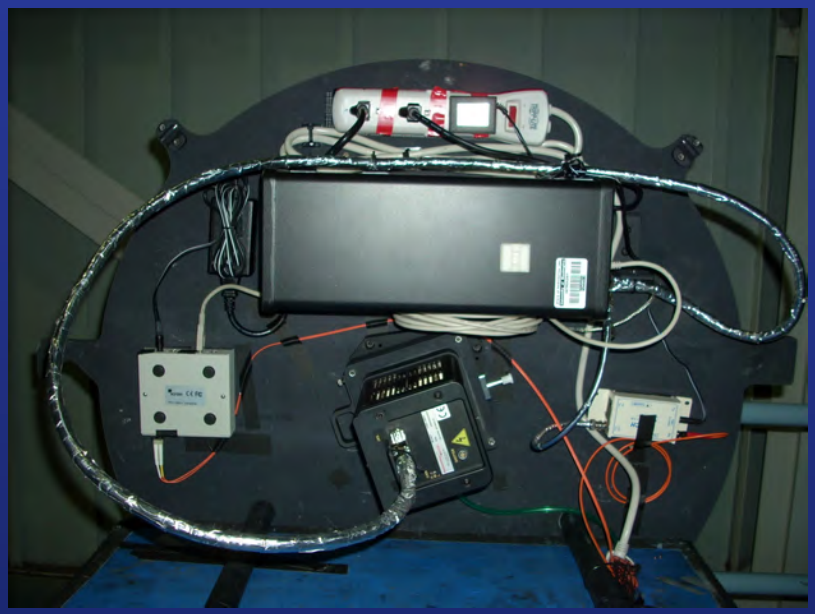
- 2048x2048 CCD, 4.7'x4.7' FOV
- UBVRI, ugriz, many narrow band filters
- V~22 in 5 min (S/N = 10)

Near Infrared Camera (NIC-FPS)



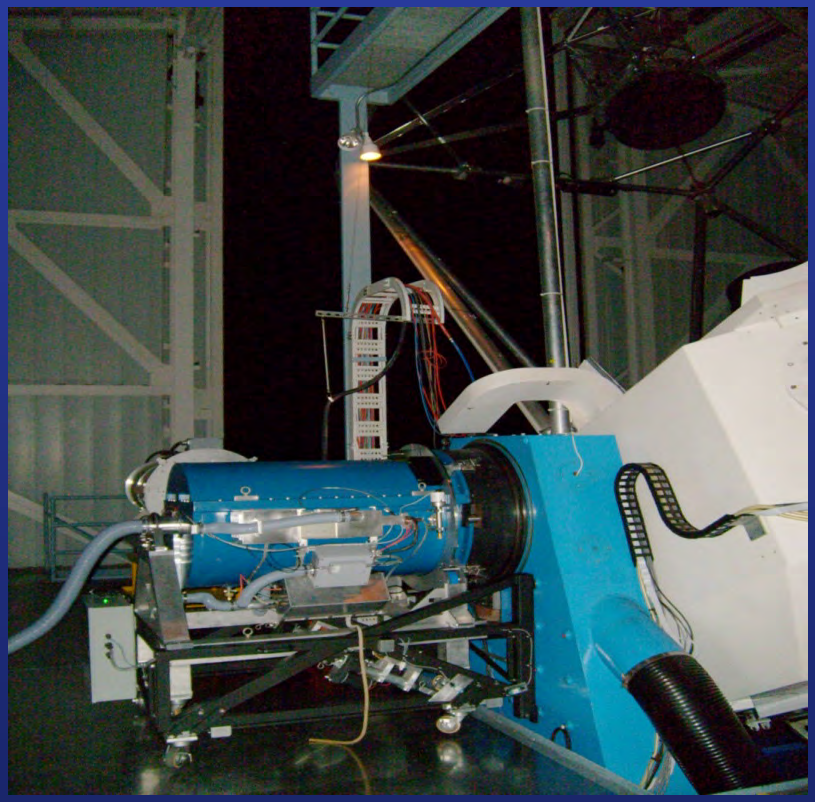
- 1024x1024 HAWAII-1RG detector, 4.5'x4.5' FOV
- ZJHK + many narrow band filters
- J~20 in 5 min (S/N=10)

High Speed Photometric Camera (Agile)



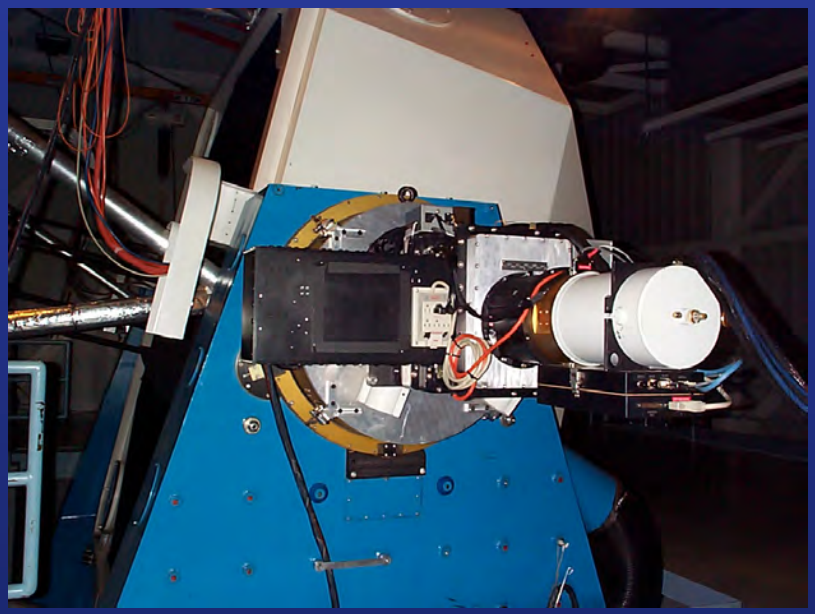
- Dedicated port, always available (planetary transits)
- Blue sensitive frame transfer camera, 0.5 sec time resolution, 2.5’ FOV
- Can use same filters as SPIcam
- r~19 in 15 sec (S/N=10)

Near Infrared Spectrograph (Triplespec)



- 2048x1024 HAWAII-II detector
- Integral K-band slitviewer
- R=3500, cross-dispersed, obtain JHK spectra simultaneously
- J~15 in 30 min (S/N=10)

Goddard Fabry-Perot Spectrograph

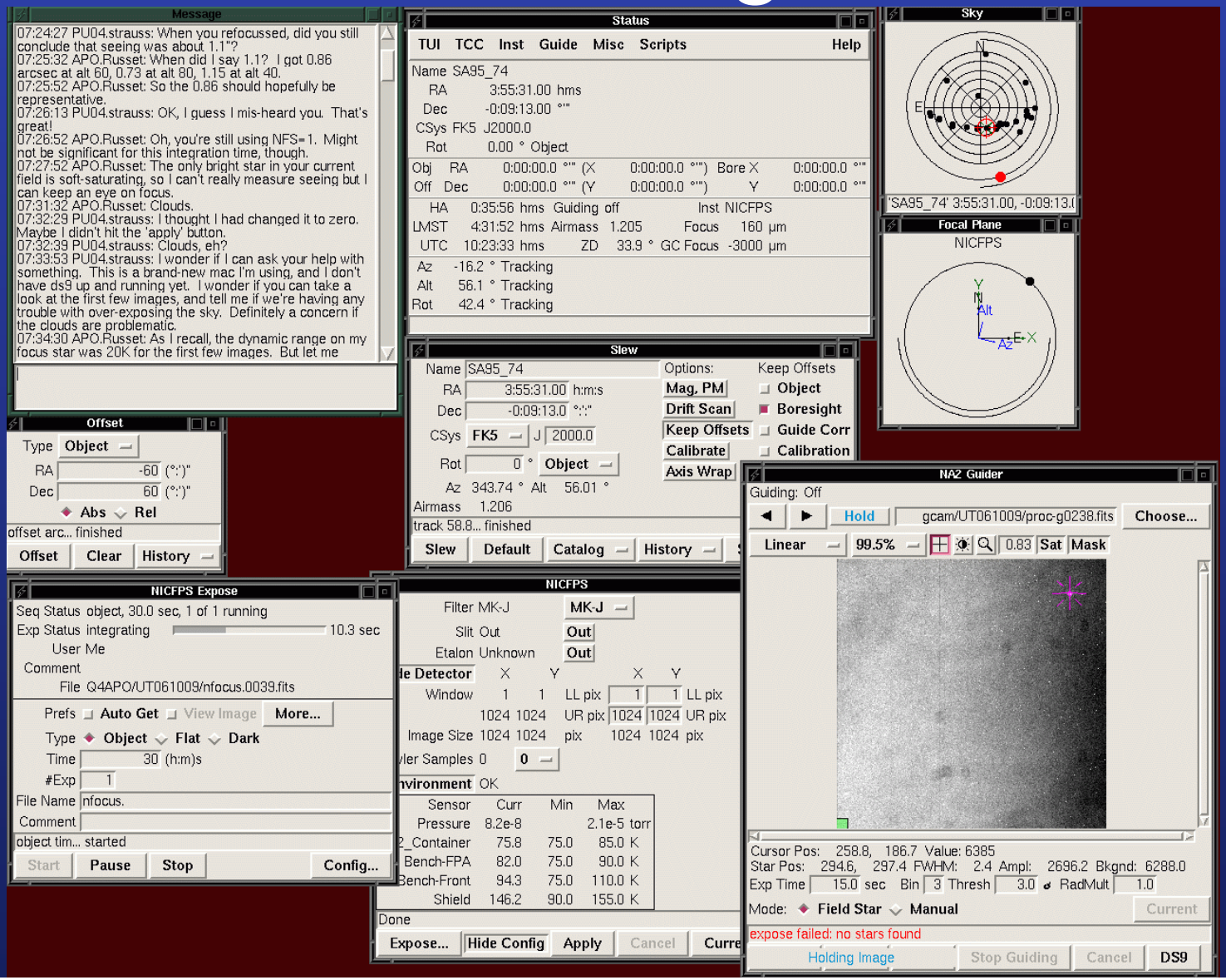


- High resolution narrow band imaging
- Permanent Visitor instrument
- Usage in collaboration with Bruce Woodgate (NASA)

APOLLO Lunar Laser Ranging

- Fire laser at the moon through the 3.5m
- Send 10^{17} photons in short bursts, receive 10 back (reflected off retro-reflectors left by APOLLO astronauts)
- Calculate distance to the moon from timing information
- Improve accuracy from 2cm to 1mm
- Tests of General Relativity, Equivalence Principle

Telescope User Interface (TUI) remote observing software



APO Facilities

- Dormitories, kitchen, observing room, instrument lab, machine shop, operations building, staff offices
- SDSS (2.5m), NMSU (1m), ARCSAT (0.5m) telescopes
- ~20 staff (engineering, software, observing support, administrative)
- Located ~ 1 mile from National Solar Observatory site at Sacramento Peak

Scientific Productivity

- ~ 500 papers in refereed journals
- ~ 30 PhD theses
- ~ 200 graduate and undergraduate students trained to observe
- Major followup resource for SDSS
- Many ground-based campaigns simultaneous with satellite observations (e.g. HST, Chandra)
- Numerous ToO and time domain programs

Summary of APO 3.5m Attributes

- Efficient, low-risk, low-cost, fully functional telescope with large suite of instruments and very low downtime (<1% per year for past 4 years). Our primary goal is that users get good data, every night!
- Flexible scheduling - half nights, rapid followup, target of opportunity, long term monitoring programs, surveys
- Fast instrument changes - all instruments kept cold and available every night
- Remote observing - reduces costs, improves efficiency, easy to use, good documentation
- Graduate student training and access
- Opportunities for university instrumentation groups, innovative programs (e.g. APOLLO laser ranging)