Small Telescopes

C. Bailyn, Yale University
Systems Workshop II
May 13-14, 2004
“Small” Telescopes in the 21st Century

• Science with small telescopes
• SMARTS – the Small and Moderate Research Telescope System – lessons learned
• A strawman proposal for 2-5m telescopes for the next decade

RESEARCH USES ONLY
Types of “Small” Telescopes

Modern alt-az 3-5m (ARC, WIYN, SOAR)
Old equatorial 3-5m (Palomar, NOAO 4m’s)
  multi-purpose user runs
Old 1-2m telescopes
  formerly multi-purpose user runs –
  now somewhat reduced usage
New < 3m special purpose telescopes
  (Sloan, 2MASS, GRBs)
Intermediate aperture, intermediate use
Science with Small Telescopes

# of nights *more important* than # of photons

time critical observations

high overhead observations
Science with Small Telescopes

# of nights more important than # of photons

Time Critical Projects I: Monitoring
Science with Small Telescopes

# of nights *more important* than # of photons

Time Critical Projects II: ToO
Science with Small Telescopes

# of nights *more important* than # of photons

Time Critical Projects III: Multi-Λ
Science with Small Telescopes

# of nights more important than # of photons

High Overhead Projects I: Calibration
Science with Small Telescopes

# of nights *more important* than # of photons

High Overhead Projects II: Bright Targets
Cerro Tololo Interamerican Obs.
SMARTS Philosophy

• No instrument changes!
• Instruments/observing modes driven by particular projects, but available to all
• Telescope time *not* split evenly by telescope for each institution
• Institutional priority lists merged to generate consortium priority list for scheduling
• “Secondary” projects fill in the gaps – not counted against primary allocation
SMARTS Telescopes 2004

- 0.9m + 2KCCD alternating service & user
- 1m + 4KCCD alternating service & user
  (coming in August/Sept)
- 1.3m + ANDICAM monitoring queue only
- 1.5m + RCSpec monitoring service & user
- 1.5m + 2K IR survey mode service only
  (coming later this year)
SMARTS Time Allocation

- 12 current partners (including NOAO)
- 25% to those who provide telescopes
- 25% to those who provide instruments
- 50% to those who provide operating cash
  (by rule: 25% to NOAO, 10% to Chile)

NOTE: institutions are *not* required to divide time equally between different telescopes
SMARTS Financing
2003-2005

- 405K$ Start-up/retention funds
- 360K$ Departmental funds
- 365K$ Grants (NASA)
- 680K$ Discretionary research funds/gifts
- 1810K$ TOTAL
SMARTS Lessons Learned: What Worked Well

- Money/effort/instruments more easily found for specific projects than for facilities
- Making telescope/instruments available for minor projects enhances science and builds community support
- Scientists from smaller institutions provide an excellent resource for operations
- Operations greatly enhanced by occasional access to larger pool of expertise
SMARTS Lessons Learned: Opportunities for the Future

• Sporadic off-site leadership (scientific and bureaucratic) not ideal
• Financial models developed for medium and large telescope projects (TSIP, AOSS) are inappropriate
• Legal instruments for membership require much greater flexibility
Moderate Aperture Telescopes in 2014

• In the south-west USA: Palomar 5m, Mayall, WIYN, ARC, Lick 3m, MDM 2.4m, Stewart 90”, McDonald 84”, NOAO 81” (and more?)

• Continued “Large Telescope” operation of all (or any!) of these telescopes is very unlikely

• One possibility: “SMARTSification” of these telescopes – a strawman proposal
Moderate Aperture Telescopes in 2014 – Organization

• Time sharing between observatories!!
• No instrument changes – duplications only if deliberate – instruments/operations determined by major projects, but available to all members
• Membership and telescope shares from contributions of telescopes, instruments, operating cash, and scientific/technical leadership – no fixed shares
• National community gets access through NOAO contributions
Moderate Aperture Telescopes in 2014 – Operations

• Each mountain has appropriate low-level engineering support at private observatory level – accept some loss of nights
• Consortium-wide staff of specialized engineering support available to all sites
• Small central administration (not NOAO) organizes contributions from scientists at member institutions – such contributions count toward consortium shares
Moderate Aperture Telescopes in 2014 – Instrumentation

• NSF-sponsored instrumentation program *not* like TSIP, in which public telescope time accrues in exchange for dollars

• Instead, private telescope time accrues from institutional contributions (*including* scientist time/effort), regardless of grant dollars provided. NOAO can compete (on behalf of community)

• Major consortium members play explicit role in peer review process

• Fully private instruments possible (zero grant dollars) but must be approved in similar manner
Moderate Aperture Telescopes in 2014 – Potential Positive Outcomes

• A complete suite of appropriate capabilities based on PI-driven large projects
• Private resources injected into the system
• Active involvement from scientists at a wide range of institutions
• Collaborations across institutions
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