

NYAC Telescope Review Committee

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1 Overview

The NYAC Telescope Review Committee met at Siena College on April 15, 2011, to review three submitted telescope proposals and to hear presentations on each telescope proposal. The goal of the review committee is provide a written report to the NYAC Board of Directors, to be sent to the chairman of the board. The report should evaluate the three proposals based on the following criteria: (1) merits of the science case, (2) merits of the telescope design including reasonableness of the proposed costs and time to completion, (3) responsiveness to the desires of the NYAC community, and the expected breadth of participation across the NY State community, (4) importance of the NYAC telescope project in support of NY science and industry, (5) degree to which the proposed project places NY State at the forefront of astronomical observatories and astronomy, and (6) merits of the funding model and partnerships, including appeal of concept to NY State, potential partnerships and sponsors outside of NY State Government, including NY State industry, the Federal Government, other university or association partners, private donors, etc. The committee report should provide a ranked list of the proposals and a rationale for that ranking, in addition to their evaluation of each proposal.

2 Review of Proposals

2.1 Gemini

1. Merits of the science case:

Strengths: This program advocates joining an existing partnership with demonstrated world-class capabilities and scientific impact. The 8-m Gemini telescopes yield access to northern and southern hemispheres and support a vigorous instrument program. New capabilities (available in 2012) such as the Gemini planet imager will yield science of unique interest to the NYAC community.

Weaknesses: The science case presented in the proposal is not very specific.

2. Merits of the telescope design including reasonableness of the proposed costs and time to completion:

Strengths: The UK, a 25% partner, is leaving and thus NYAC could gain almost immediate access. As existing telescopes already in operation, the proposal is lowest risk. If NYAC plans to participate in E-ELT, the proposer argues that it is better to be involved in Gemini. Finally, a new telescope is not needed as there are already a sufficient number of larger-aperture telescopes.

Weaknesses: UK share is currently \$10M/yr, which is likely beyond what NYAC could contribute.

3. Responsiveness to the desires of the NYAC community, and the expected breadth of participation across the NY State community:

Strengths: The Gemini proposal meets the community's request for optical/IR imaging and spectroscopy.

Weaknesses: Statistics show that NY astronomers have not used the Gemini telescopes extensively in the past. Some have suggested that it has not been easy using the Gemini telescopes.

4. Importance of the NYAC telescope project in support of NY science and industry:

Strengths: One potential hook for NY industries is that Gemini is in need of a spectrograph. The proposal suggests that this could be built in NY. In addition, the telescope would require a NY operations center.

Weaknesses: Gemini instruments are bid competitively, so there is no guarantee that NY would see immediate reinvestment of the membership funds in instrumentation programs.

5. Degree to which the proposed project places NY State at the forefront of astronomical observatories and astronomy:

Strengths: NYAC would have increased access to two of the ten largest, scientifically productive telescopes in the world. Existing technology, such as the Gemini planet imager and recent advances in multi-laser AO, are desirable instruments. Gemini also has a time exchange with the Subaru and Keck telescopes to complement instrument capabilities.

Weaknesses: Realistically NY could buy only a 5% share of Gemini, so we will not be a major player in the telescope.

6. Merits of the funding model and partnerships, including appeal of concept to NY State, potential partnerships and sponsors outside of NY State Government, including NY State industry, the Federal Government, other university or association partners, private donors, etc.:

Strengths: The funding model includes instrumentation, institutional financial commitments, and support from state legislature, yet the details of such a plan are uncertain.

Weaknesses: The committee felt that this proposal would be hard to sell to donors for several reasons. First, we are getting only part of a telescope. Second, the US already owns 50%, and NY astronomers use very little of the currently available Gemini time. Furthermore, NYAC will not have sufficient time to explore funding opportunities before a decision to participate is required. Finally, the committee was concerned that the existing collaboration would be difficult to work with.

2.2 ALPACA

1. Merits of the science case:

Strengths: ALPACA could play an important role in solving the dark energy equation of state. None of the existing projects alone will be able to do this.

A survey of this kind has the potential to bring NY astronomers together in SDSS-type collaborations, focused on science areas of interest.

Weaknesses: Limited sky view.

2. Merits of the telescope design including reasonableness of the proposed costs and time to completion:

Strengths: As a drift-scan telescope, the design is simple in principle. The telescope will be located at CTIO, in close proximity to LSST, which will presumably maximize the synergy between the two surveys.

The liquid mirror reduces the costs to \$1 million rather than \$10 million required for a solid mirror.

Operating costs are estimated at \$300k per year.

Weaknesses: By design, the drift scan mode is not capable of targeted observations.

The committee deemed the liquid mercury mirror untenable given the telescope's location in an earthquake zone and the large potential liability to NYAC. In addition, members were concerned about the optical flaws introduced by mylar. Therefore, a glass/ceramic mirror is recommended.

The committee felt the cost estimates were unreasonably low. Given the currently available technology, meeting the design objectives is uncertain.

3. Responsiveness to the desires of the NYAC community, and the expected breadth of participation across the NY State community:

Strengths: The ALPACA program is conceived as a physics experiment with a strong focus. It should be easy for the NYAC community to decide if it has the skills and interest to participate.

Weaknesses: The proposal does not address the broad desires of the NYAC community.

4. Importance of the NYAC telescope project in support of NY science and industry:

Strengths: It is possible that some design and construction work that could be carried out by NY companies. For example, Corning or ITT could fabricate the secondary/tertiary mirrors.

Weaknesses: Very specialized project with a limited scope.

5. Degree to which the proposed project places NY State at the forefront of astronomical observatories and astronomy:

Strengths: If a glass/ceramic mirror is chosen over a liquid mercury mirror, then Corning and ITT are likely contractors.

Weaknesses: Very few NY astronomers are currently involved, so the importance of this project to the wider NYAC community is unclear. The committee perceived ALPACA more as an experiment suitable for one or two PIs, not for the entire state.

6. Merits of the funding model and partnerships, including appeal of concept to NY State, potential partnerships and sponsors outside of NY State Government, including NY State industry, the Federal Government, other university or association partners, private donors, etc.:

Strengths: Relatively low cost project.

Weaknesses: NYAC would be entering into an existing collaboration, so there does not appear to be much flexibility. ALPACA is not a project for NYS. It is an experiment, a unique one, and it should be done. But it is not for the state.

2.3 Astronomical Telescope for New York

1. Merits of the science case:

Strengths: The design envisions a general purpose large telescope capable of addressing a broad range of science questions. The design would support innovative instrumentation, which would keep this telescope at the forefront of astronomical science.

The design incorporates adaptive optics in a fundamental way.

Weaknesses: The project may be too ambitious for NY State alone. Given the cost and scope, multiple partners will need to be identified and coordinated.

2. Merits of the telescope design including reasonableness of the proposed costs and time to completion:

Strengths: This could be the largest telescope in the world, at least for a few years. The telescope design uses lessons learned from existing segmented mirror telescopes and incorporates cost-saving innovations from current ELT design programs.

Weaknesses: The overall cost to NYAC is large, estimated at \$105M total, \$30M for the first 2 instruments, and \$10M/yr in operating costs.

3. Responsiveness to the desires of the NYAC community, and the expected breadth of participation across the NY State community:

Strengths: NY astronomers would love to have such a telescope.

Weaknesses: Project may be too large to undertake in NY with no previous experience in building large similar facilities.

4. Importance of the NYAC telescope project in support of NY science and industry:

Strengths: As currently envisioned, the telescope would be built mostly of parts/instruments from NY State, including glass from Corning and fabrication by ITT.

Weaknesses: The committee was unclear if the expertise required to build such a telescope and a high-resolution spectrograph currently exists in New York.

5. Degree to which the proposed project places NY State at the forefront of astronomical observatories and astronomy:

Strengths: The telescope would be 1.5 times larger than Keck, with an adaptive secondary. As previously stated, this would make it the largest telescope in the world for some limited period of time.

Weaknesses: As a new telescope project, it will realistically be more than a decade before we are on sky. NYAC would incur a tremendous cost for this telescope, yet the discovery space is comparable to other telescopes. The committee would like to see other telescope sites considered.

6. Merits of the funding model and partnerships, including appeal of concept to NY State, potential partnerships and sponsors outside of NY State Government, including NY State industry, the Federal Government, other university or association partners, private donors, etc.:

Strengths: The committee views the plan for heavy involvement on the part of NY companies in the design and fabrication of the telescope as a strength which improves the sellability of the telescope to government agencies.

Weaknesses: The cost of operating such a facility would be too high for NY State, assuming that the operating costs per year of such a large facilities are about 10% of the capital costs.

3 Summary and Committee Recommendations

3.1 Summary of Proposals

The committee concluded that none of the proposals in their current form was viable. All of the proposals are weak in terms of the funding model.

Ranked list:

ATNY

Gemini

ALPACA

ATNY: The ATNY proposal is the most aggressive and compelling in terms of its scientific and technical goals, and this project clearly meets the needs outlined by NY state astronomers (in line with survey results). One major concern for the committee is the uncertainty in the funding stream, and this prevents us from recommending the proposal in its current form. It seems to us that \$100M

is out of the question, and the proposers need to make the case that this is feasible. Funding this proposal will be a major challenge in the current economic climate. The timeline for completing such a project, which is realistically in excess of ten years, was cause for concern. The committee also has concerns about the preparedness of NY State groups to build such a large instrument. We have not done this before, so it would be difficult to assemble an appropriate team.

Gemini: While the Gemini proposal would give immediate access to world-class, scientifically productive telescopes, the proposal left the committee with many unanswered questions. For example, even if NY acquired the full UK share of 25% of the operating costs, there is no guarantee that the Gemini board would extend an equivalent amount of observing time. The proposal does not specify how in-kind contributions would be handled nor the role NY would play in the new partnership. The committee feels that this proposal would be very difficult to fund because NY and most donors are more interested in supporting capital expenditures than in funding operating costs. Another major concern is that NY astronomers at present under-utilize the available community time on the Gemini telescopes, so the need for a larger share in telescope time is not clear. Finally, the committee feels that the telescope is very expensive and inefficiently managed. If NY contributes approximately \$10M per year, then after 10 years we have invested \$100M and all we have are the observations we have made.

ALPACA: The ALPACA proposal presents compelling science that can be achieved at relatively low cost. The committee recommends that a solid mirror be used in place of a liquid mirror, but this change alone would not significantly alter the ranking of the proposal. The committee concluded that while ALPACA is an interesting and worthwhile experiment that should be done, the telescope does not meet the needs of NY State astronomers; this is not a general purpose telescope.

3.2 Recommendations for Proceeding with a New York State Telescope

The committee puts forward three recommendations that can be pursued simultaneously by NYAC.

Recommendation #1: Bring ATNY to a wider community of NY astronomers in an effort to gain widespread support.

The committee recommends that NYAC call a meeting or workshop that is devoted solely to the subject of the telescope initiative. The community should be briefed on ATNY as currently envisioned. The workshop should include ample opportunity to discuss alterations/improvements to the telescope as proposed. Serious effort must be devoted to developing a realistic funding model. A unified NY community is essential if we are to attract significant state or federal funding.

Recommendation #2: Enter into a smaller, existing collaboration that can meet the immediate needs of NY state astronomers while building the infrastructure and personnel required for undertaking a larger telescope project.

The committee recommends that NYAC simultaneously pursue joining a smaller, existing tele-

scope collaboration. This would enable NY to start building the infrastructure and expertise required to operate and build a large telescope in the future. While the prospects of securing operating funds are vastly less than for capital expenditures, it may be possible to fund participation in a smaller collaboration through contributions from NYAC institutions. Another possibility is to buy into an existing collaboration by building an instrument.

Recommendation #3: NYAC should consider joining a future major telescope.

The committee recommends that NYAC explore options to join future major telescope projects such as TMT, GMT, and CCAT. TMT and GMT are general purpose giant optical telescopes, and CCAT is a far infrared mostly survey telescope with a broad scientific mission. At a cost of \$50 to \$100 M, this may give NY some 10% of the observing time of the GMT or the TMT