

GSMT SWG Meeting
17-18 March, 2003

PLEASE NOTE ASSIGNMENTS BELOW, AND CONFIRM COMMITMENT TO MEETING THE DEADLINE VIA E-MAIL TO STROM AND NOVACK

Synthesis of CELT, Magellan 20 and LAT Presentations

The underlying scientific cases for all projects are similar, and similar to the programs identified by the SWG as the main *raison d'être* for a powerful next generation O/IR facility:

- Cosmology and large-scale structure
- Birth and assembly of galaxies
- Origin and evolution of black holes
- Characterization of exo-planets
- Formation of solar systems

LAT places more emphasis on a combined optical and sub-mm program survey program that aims at statistical study of visible and obscured galaxies in the early universe. Summaries of the project presentations will be posted on the GSMT SWG website.

The 3 projects all propose wide-field, MOS capability along with multiple systems for adaptive correction:

- Correction for ground-layer seeing, which at J-band and beyond offers the possibility of 2x gains in delivered image quality over a field of view 5' or greater
- Single-conjugate LGS AO, which provides good Strehl ratios over modest FOV (~10") at J-band and beyond
- Multi-conjugate AO systems with laser- and natural- guide-star constellations that provide uniform Strehl (>0.7) at H-band over FOV of 1' or greater
- Extreme-AO systems that provide high Strehl (>0.9) in the near-IR.

The projects differ in the staging of AO capabilities, and in particular their near-term reliance on MCAO.

Despite the difference in conceptual approach to telescope design, there is broad overlap in the key technology developmentst needed to achieve all project goals:

- AO components and systems (fast, low-noise detectors; deformable mirrors, including large adaptive elements; robust, reliable high power lasers)
- Durable advanced mirror coatings (high reflectivity from 0.4 to 20 microns; up to 10 year lifetime)
- Detectors; gratings; other instrument technologies

The Initial SWG Document

The combination of discussion to date and the presentations by the projects provide the basis for the SWG's moving ahead with confidence in preparing a document that (1) provides a powerful science case for GSMT; and (2) the rationale for NSF investment in technology development and engineering design studies to advance all ELT projects.

The SWG believes that this document must:

- Develop and present a science case suitable for a broad audience, including physicists; biologists; Congressional and OMB staff. The document should be comparable to the recently released "From Quarks to the Cosmos".
- Outline the technology developments and engineering studies that are needed to advance all ELT efforts, and thus form a natural focus for near-term NSF investment. The requirements for technology investments should be linked to perceived long-term returned science value. Approximate costs and schedules for these efforts should be developed (NIO lead, in consultation with other groups).
- Indicate how its proposed strategy advances the goal of achieving large community goals via public-private partnerships
- Provide clear indication of the potential synergies between GSMT and ALMA – a key timeliness argument.

Content of Science + Technology Report

A. Science

Content Areas (Lead in italics)

- (1) Birth of stars and planets (*Strom* and *Najita*)
- (2) Exploring other planetary systems (*Strom* + *Lunine* + *Najita*)
- (3) The birth and growth of Black Holes –AGN connection (*Bechtold*; *Ho*)
- (4) The birth and assembly of galaxies ('building a galaxy') – *Barton-Gillespie*; IGM tomography *Bechtold*; *Steidel*; *Dressler*. Also include 'first light' via lensed superclusters.
- (5) Cosmology and LSS – *Colless*; *Carlberg*
- (6) Complementarity to ALMA + JWST (*Mould*)

Template

The goal is to develop text according to the following template:

(i) Statement of problem and its importance

Illustrations that vivify the problem are important here (not only verbal but visual!)

(ii) Status of current understanding, what advances are expected in the next decade, and why a next generation ELT is needed

This section should provide summaries at two levels: (a) a qualitative description suitable for OMB and Congressional staff; and (b) quantitative arguments indicating what thresholds in angular resolution; sensitivity; sample size....must be crossed to enable significant progress

iii) Description of key measurements needed

Here what is needed is a quantitative summary of (a) angular resolution; (b) spectral resolution; (c) photometric accuracy; (d) sample size, etc. needed to address key problems. Include examples of flux limits; signal/noise needed; integration times to reach flux limit at required signal/noise. Simple, uncrowded tables and figures are required here.

(iv) Comparison with JWST

Prepare quantitative examples clearly delineating the role of JWST and NGST in addressing the problem and carrying out key measurements. The goal is to illustrate the synergy of GSMT with JWST in a 'system' sense, and to indicate clearly the unique role played by GSMT.

(v) Qualitative discussion of GSMT role in ALMA, Con-X, SKA.....era.

The goal here is to provide our colleagues, agencies and staffers with straightforward arguments summarizing the complementarity of GSMT to other planned ground- and space- based facilities expected to mature over the next 10-15 years.

(vi) Quantitative examples illustrating performance as a function of key design parameters.

What is suggested here is a comparison of performance of GSMT in providing key measurements as a function of (a) aperture; (b) delivered image quality; (c) field of view; (d) emissivity; (e) wavelength range available.

B. Technology

Content

Summary of telescope concepts based on presentations; available information on websites (*Stepp*)

Summary of where technology development is needed (*Stepp in consultation with project PMs and PSs*)

AO technology development (*Rigaut; Max; Ellerbroek; McIntosh*)

Instrument concept and technology development (*Simons; Herter*)

Link between technology and science (*Stepp and Strom*)

Schedule for Draft 1 Completion

Electronic versions (word documents + illustrations) by **22 APRIL, 2003**

Next GSMT SWG Meeting

28-29 April, 2003 in Tucson, AZ. *Holly Novack* will distribute logistical details before 27 March.

The focus of the meeting will be to review draft documents and reach consensus on content. Following the meeting, *Strom and Stepp* will take responsibility for preparing the final, edited draft of the report. In order to meet deadlines, it will be essential for those responsible for preparing text to follow the template outlined above.