Statement from ACCORD for ASTRO2010 Consideration

To: The Astro2010 Panel

From: ACCORD[1]

Re: Status of the Profession/ Optical and Infrared Ground-based Astronomy

Background

This submission by ACCORD provides input on O/IR ground-based astronomy to the Astro2010 panel. ACCORD is a group of observatory directors that represent all US O/IR telescope facilities with aperture greater than 3m. A current list of ACCORD members is provided in Attachment A, along with a list of the telescopes which they represent[2]. These include LBT, Keck, HET, Gemini, Magellan, MMT, Hale, WIYN, ARC and Shane telescopes.

What is ACCORD. ACCORD (like its predecessor, CDIAO) is an informal association of observatory directors formed in order to optimize research capabilities for US ground-based O/IR astronomy, many of the facilities for which have been built largely on funding from non-federal sources. Thus over 80% of the collecting area listed in Attachment A is operated by the independent observatories.

Current Issues

The System/TSIP. The strong competitive position of US ground-based O/IR astronomy during the past century can arguably be attributed in large measure to this mixed private-public investment. The approach has, however, the disadvantages that some capabilities are duplicated, the resources available to the general astronomy community are in some cases limited and the "efficiency" of this system may not be as high as would be possible with a more coordinated approach.

In an effort to correct these disadvantages, it was proposed that NSF funds should be provided to enhance instrumentation at the major independent observatories in exchange for time being made available to the astronomical community on peer-reviewed basis administered under the auspices of NOAO. This in turn led to the concept of the "System" for O/IR ground-based astronomy as recommended by the previous decadal survey. The instrumentation program was ultimately implemented as TSIP, the Telescope System Instrumentation Program, which has been in existence for approximately a decade. TSIP is widely viewed as a successful initiative (see ALTAIR committee report) in that important new instruments have been funded and the community has gained valued access to the independent observatories[3]. It has also led to some coordination of instrument development programs across the US O/IR community. ACCORD has served as a coordinating council for these activities under the auspices of AURA.

[1] ACCORD is the AURA Coordinating Committee of Observatory Research Directors.

[2] The respective directors/observatories also operate multiple O/IR telescopes of smaller aperture.

In 2004, a TSIP review suggested modifying the program to include simple acquisition (the "buy time" mode) by NSF/NOAO of community observing time at the independent observatories without tying it to instrumentation construction. The rationale here was that the number of instruments that can be effectively deployed on any one telescope is limited so that funding required for instruments was likely to peak, whereas scientifically-driven need for community access to these facilities would continue to grow. This mismatch could, in principal, be resolved by NSF/NOAO purchasing time for the community. At present this option for TSIP proposers is calculated at the actual operating cost (incentive factor 1) leaving no additional funds for the observatory. As a result, little time has become available to date; an incentive factor of 1.5 (or greater) would change this picture.

More recently, several review/planning committees (e.g. ALTAIR, Future of NOAO) have suggested that, for the overall benefit of US astronomy, the TSIP program should be expanded to perhaps $10M/year from its current (intermittent) $4M/year. At its February 26th 2009 meeting, the members of ACCORD confirmed that they would be willing and able to provide the corresponding amount of community observing time[4] in a combination of "instrumentation" and "buy time" modes. This mutual interest arises from the growing demand for resources to construct and operate increasingly complex instrumentation at the independent observatories and the expanding community desire for access to these capabilities. ACCORD stresses that it is essential for all parties involved (independents, NOAO, community observers) that there be annual continuity in the TSIP funding stream – rather than the "on-again-off-again" approach to the program experienced so far.

Adaptive Optics (AO) .The power of adaptive optics in astronomy has long been recognized by ACCORD. While the gains are most dramatic for the larger apertures, AO can also be applied productively on those of intermediate aperture. AO is also critical to the scientific case for the Extremely Large Telescopes (ELTs) of the future. While successful implementation of AO has taken much effort over many years[5], the power of AO has been confirmed by a growing stream of astronomical results; these include the proper motions of stars near the Galactic Center, images of planets around nearby stars and improvements in effective seeing over fields of many arc-minutes - to name but three. Following the recommendations of the previous decadal survey, ACCORD has been a constant advocate of expanded NSF support for AO work and recently (2007) commissioned an update to the AO roadmap. More detailed reports on technical and international competitiveness aspects of the AO situation are being provided to Astro2010 separately (Dekany et al (2007); Frogel et al (2007)). The revised AO roadmap, which is strongly endorsed by ACCORD, emphasizes that implementation and operation of AO systems, whether in diffraction limited or ground-layer[6] mode, requires substantial and consistent investment. ACCORD believes that the US O/IR community has been substantially underfunded for AO work if it is to remain competitive, especially with Europe, in the crucial AO arena. ACCORD thus recommends that NSF provide funding of approximately $4M/year, **stable** over a 10 year

[4] This commitment assumed continuation of the current process for "instrumentation" projects (Incentive factor 2) and a "buy-time" program (with incentive factor 1.5).

[5] Progress has arguably been slowed by inadequate and intermittent NSF funding over the last decade (Frogel et al 2007

[6] While the ground-layer correction mode is perhaps less well known, it has recently been demonstrated (Hart et al 2009) to improve seeing by a factor of almost 3 over a field substantially greater than 2 arcmins.

period, to support AO development work (the earlier label of AODP would be appropriate) in addition to AO implementation proposals being considered under TSIP, MRI etc. ACCORD also reiterates that AO is of critical importance to the case for the ELT generation.

Development New Components of the System in the Next Decade.

Telescopes. The previous decadal survey recommended two major projects, in addition to establishment of the System, for O/IR astronomy – namely the Giant Segmented Mirror Telescope (GSMT) and the Large Synoptic Survey Telescope (LSST). Two approaches have emerged for each and as a result the latter is now referred to generically as the LST. Detailed descriptions of the TMT and GMT versions of GSMT are being provided independently to Astro2010; the same is true for the Pan-STARRS and LSST versions of LST. These projects have made significant progress in the last decade with some NSF or other federal technology development funding and, in the cases of TMT, GMT and LSST, with substantial amounts of non-federal (largely private) support. It thus appears that the major future developments in US ground-based O/IR astronomy will continue the tradition of public-private partnerships that has evolved into the current Telescope System.

There has been debate within the community about the priorities to be assigned to LST (survey mode) and GSMT (detailed/spectroscopic mode) especially given the current and likely future economic climate. ACCORD views both as essential components of US astronomy if it is to remain scientifically competitive in the future in the international arena. The history of astronomy, especially in the second half of the 20^{th} century in which the entire electromagnetic spectrum was opened up for investigation, clearly demonstrates the remarkably productive synergy between survey and detailed study/follow up modes. This statement applies not only to synergies within the O/IR waveband (e.g. SDSS/Keck) but perhaps especially between surveys at other wavelengths and the O/IR. For example, radio, x-ray and gamma ray surveys have gained enormously from follow up with large telescopes at O/IR wavelengths. This synergy can confidently be anticipated in the LST/GSMT era, as can the need for follow-up telescopes of significantly greater aperture than the survey instrument. Furthermore, the follow up instruments will require a range of capabilities including, for example, wide-field multi-object O/IR spectroscopy and diffraction-limited imaging over the widest wavelength range possible - depending on the science involved.

It is for these reasons that ACCORD strongly endorses a combined plan for survey and more detailed study that is a combination of LST and GSMT. Certainly, the US should avoid leaving Europe, with its planned EELT, unchallenged in detailed study mode. ACCORD believes that such a plan is not only necessary but also feasible given the long US tradition of private funding for O/IR astronomy, the more recently established Telescope System of public-private partnerships and international institutional collaborations. Such combinations are indeed present in all of the LST and GSMT consortia, with private funding likely to grow rapidly in the future. ACCORD suggests that the Astro2010 report should (a) endorse a coordinated LST + GSMT plan and thereby encourage increased private support for these projects; and (b) encourage the NSF to continue providing technology development support and to prepare for construction and

operations contributions to LST and, in the case of GSMT, accompanied by commitments of public observing time.

Major Future Instruments. For the healthy development of ground-based O/IR astronomy, ACCORD recommends increasing NSF funding for TSIP and for the AODP, in both cases with the understanding that funding rates for both programs should be relatively stable.[7] This represents ACCORD's top short term priority. ACCORD is also aware that major instruments for large telescope are increasing in complexity and hence costs, yet will be essential if US astronomy is to remain competitive. ACCORD anticipates instrument funding needs with unit costs in the $20M - $60M range. These sums are beyond the capacity of ATI, TSIP and MRI and below the lower bound ($100M) for MREFC requests. ACCORD suggests that the Astro2010 panel review this situation - which apparently afflicts other fields at the NSF - and consider recommending establishment of a new program to address projects in the intermediate cost range.

Signed

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[7] In particular they should not provide the mechanisms for solving immediate budget shortfalls as has happened on multiple occasions in the past.

Attachment A

ACCORD

Members and Telescope Affiliations

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*Dr. Hawley is prevented from signing this document as she is a member of one of the ASTRO2010 panels