



4 January 2000

Reply to Attn of:

SD50

To Whom it May Concern:

I have read the proposal to NSF-MRI from NJIT and UH for partial funding for building a 1.6-meter New Solar Telescope (NST) at BBSO. I find the proposed project to be scientifically compelling, technically sound, and highly cost-effective.

The Japan/US/UK Solar-B space mission, scheduled for launch in 2005, will have a 0.5-meter visible-light telescope equipped with a vector magnetograph. In the perfect seeing of space, with 0.2 arcsec resolution, this telescope will provide "space-truth" observations of the Sun's fine-scale magnetic structure and dynamics, which globally sustain the corona and solar wind, and locally trigger the large magnetic explosions (coronal mass ejections) that produce hazardous space weather. The Solar-B telescope will have a role in solar astronomy analogous to the role that the Hubble Space Telescope has had in night-time astronomy. Large ground-based visible/IR solar telescopes will be able to complement Solar-B in the way that large night-time telescopes (such as the Keck telescopes) have complemented the HST, by providing greater spectral sensitivity via more light from larger apertures and comparable spatial resolution via adaptive optics. The 1.6-meter NST will have 10 times more collecting area than Solar-B, and NST's adaptive optics will give it sustained spatial resolution at or beyond the 0.2 arcsec diffraction limit of Solar-B. Thus, the NST will be well capable of complementing and significantly surpassing the discovery observations from Solar-B.

I was a member of the recent NAS/NRC Task Group on Ground-Based Solar Research (Parker Committee), was a member of the Solar Astronomy Panel (Knoelker Panel) of the NAS/NRC Survey of Astronomy and Astrophysics, and am a member of the Big Bear Solar Observatory Advisory Committee. These groups have all emphatically concluded that it is now technically feasible and scientifically imperative for ground-based solar astronomy to advance into the 0.1 arcsec and higher resolution regime via large-aperture ( $\geq 1$  meter) telescopes equipped with adaptive optics. Such collecting area and resolution are mandatory in order to resolve, measure, and track the magnetic, thermal, and flow structure of the elementary flux tubes in which practically all solar magnetic fields are rooted. The structure and interaction of these magnetic elements in the photosphere and chromosphere are fundamental to all aspects of the magnetic Sun, from the dynamo, to the magnetic modulation of the Sun's luminosity, to coronal heating and the solar wind, to flares and coronal mass ejections. On this basis, the NSF is presently funding the design of the National Solar Observatory Advanced Technology Solar Telescope (ATST), to be built




near the end of this decade. The NST is a valuable and prudent intermediate step for bridging the way to the ATST, both scientifically and technologically. The NST will define the observational questions and limits to be attacked and surpassed by the ATST. Of equal importance, the building and operation of the NST and its adaptive optics will reveal and solve many of the technical problems that will face the ATST.

The proposed NST upgrade of BBSO will be carried out by a highly qualified team of world leaders in developing high-resolution solar telescopes, adaptive optics, image reconstruction, and vector magnetographs. With other funding, much of it from NSF, this team is presently developing adaptive optics, real-time image reconstruction, and new visible and IR vector magnetographs for use on the BBSO 65-cm telescope. The NST will parlay the investment in these leading-edge instruments to a much greater science payoff than can be had from the 65-cm telescope. At the same time, the development of the NST and its instrumentation will train several of the next generation of instrumentalist solar astronomers who will use and improve the ATST and its instrumentation.

The proposed NST is a low-cost, low-risk prudent bridge to the ATST, and along the way will complement Solar-B and will make its own discovery observations of the fine-scale magnetic Sun.

Sincerely,

A handwritten signature in cursive script that reads "Ron Moore".

Ron Moore  
Solar Physics Group  
Space Science Department