Sunday Afternoon, October 19, 2008

IPF 2008 Frontiers in Imaging: from Cosmos to Nano
Room: 312 - Session IPF-SuA

Astronomical Imaging

Moderator: L. Hartmann, University of Michigan

3:00pm **IPF-SuA1 Large Telescope Projects**, ***R. Bernstein***, University of California, Santa Cruz **INVITED**

Over the last 150 years, the diameter of the largest operating telescope has doubled every 30 years. The last generation of telescopes (6-10 m diameters) have been in scientific operation for about a decade. While those projects faced a number of optical and structural challenges, the success of the next generation of telescopes depends not only on conquering the technological challenges that come with scaling up large structures, but also on controlling costs and achieving new standards in image quality through active controls and adaptive optics. In this talk, I will discuss some of the challenges associated with building and operating the next generation of "Extremely Large" Telescopes (ELTs).

3:40pm **IPF-SuA3 Instrumentation for Large Telescopes**, ***D. Fabricant***, Harvard-Smithsonian **INVITED**

In the past 25 years, the application of new technologies has transformed instrumentation for large, ground-based telescopes. These technologies include the development of large optical and infrared array detectors, newly available large crystalline and optical glass lens materials, and high speed robotics. Harnessing these technologies requires a high level of sophistication in engineering and applied physics, including optical, thermal, structural, and control system design. I describe state-of-the-art instruments for imaging and spectroscopy now operating at large telescopes, and look forward to our plans for the next generation of extremely large telescopes.

4:20pm **IPF-SuA5 Adaptive Optics in Astronomy**, ***B.L. Ellerbroek***, TMT Observatory Corporation **INVITED**

Adaptive optics (AO) is a technology for the real-time correction of the optical aberrations experienced by light waves as they propagate through atmospheric turbulence and similar distorting media. AO is now used at numerous ground based astronomical observatories, and currently obtains (for many applications) image quality which approaches what could be achieved with the same aperture diameter in space. The benefits of AO increase dramatically with telescope size; for the future generation of extremely large telescopes, the benefits of AO may be as great as 100 times larger than can be obtained with existing telescopes on account of the factor of 10 advantage in collecting area. In this presentation, we will briefly review the fundamentals of adaptive optics, illustrate some of the astronomical results which have been achieved using AO to date, summarize the recent advances in component technologies and system concepts which enable the implementation of AO on future extremely large telescope, and finally, describe the designs and expected performance of the “first light” AO systems for the Thirty Meter Telescope project.

5:00pm **IPF-SuA7 Imaging with Near-infrared Interferometers**, ***J.D. Monnier***, University of Michigan **INVITED**

Under the best conditions, telescope diffraction limits the angular resolution for astronomical imaging. Using interferometry, we can coherently combine light from widely-separated telescopes to overcome the single-telescope diffraction limit to boost our imaging resolution by orders of magnitude. I will review recent technical advances combining four telescopes of the CHARA Array on Mt. Wilson, CA, with baselines of 330 meters allowing imaging with sub-milli-arcsecond resolution. I will present the first resolved images of main sequence stars besides the Sun and show first results imaging interacting binary systems.

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