SCIENCE DRIVERS/FACILITY REQUIREMENTS FOR A FUTURE UV-OPTICAL-near IR TELESCOPE

What we would like to know:

1. What are *your* favorite science drivers, i.e., your own science interests that such a telescope could investigate?
2. Putting your own interests aside, what do you think are the most important drivers overall? (If the answer to this question is “same as above”, that’s OK.)
3. Are there particular telescope/instrument configurations that the answers to the questions above require?

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Science talks that we heard yesterday…

- Massive Stars: Key to Solving the Cosmic Puzzle - Aida Wofford
- Nearby Galaxies under Magnification: New Science with a Future UV-Optical Telescope - Daniela Calzetti
- Science Cases for Space UV Polarimetry in the 21 Century - B-G Andersson
- Star Formation and Outflows - Patrick Hartigan
- Solar System Science with a Future Flagship-Class UV-optical Telescope - Walt Harris
- The Baryon Cycle and Galaxy Ecosystems: Studies of the Circumgalactic Medium of Galaxies and the Intergalactic Medium - Chris Howk
- High-redshift Galaxy and Deep-field Studies - Marc Rafelski
- Galaxy Fueling and Quenching - Jason Tumlinson
- Determination of Galaxy Luminosity Functions at Energies Above the Lyman Edge - Stephan McCandliss
- Understanding the Life Cycle of Gas from Protoplanetary Disks to Exoplanets - Kevin France

White papers that we received in the most recent call

- See the workshop web page here:

http://sig2.asu.edu/sub_science.html

What themes emerged from the science breakout sessions yesterday?

- We could consider telescope + instrument capabilities that the various speakers required:
  - bandpass
  - spectral resolution
  - angular resolution
  - multiplexing capability
  - etc.

1. BANDPASS

1. BANDPASS: **far ultraviolet.**

- Aida Wofford
  - **ultraviolet**+optical extinction curves
  - R = 10000 **ultraviolet** spectroscopy (large samples)
  - R = 1000 **ultraviolet** spectroscopy (extreme environments)
- Daniela Calzetti
  - Outer disk regions for galaxy growth – **ultraviolet** , large FoV, sensitivity
  - Upper end of the IMF – **ultraviolet** , optical narrow-band, high angular resolution, sensitivity
- B-G Andersson
  - Significant new discovery space exists for **ultraviolet** polarimetry
- Pat Hartigan
  - Wavelengths shorter than Ly α (i.e., **ultraviolet**) are important to bridge temperatures to X-rays
  - Broad **ultraviolet** coverage needed for any complete temperature/ ionization analysis
  - O VI provides a unique means to study coronae, shocked interfaces, and hot winds (i.e., **ultraviolet**)

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- Walt Harris
  - *MHD processes (aurora, recombination, corotation, currents) produce signatures in the* **ultraviolet**
  - **ultraviolet** *absorption at upper atmospheric regions of photochemical and photoionization processes*
  - *Scattering of solar* **ultraviolet** *emission isolates upper atmospheric structure, the heliosphere, and near-space environments (exospheres and magnetospheres).*
- Chris Howk
  - Look at nice "critical capability boxes" for each driver; all state "far **ultraviolet** capability to 1000 Angstroms"
- Marc Rafelski
  - Study of clumpy galaxies at low redshift for comparison to higher redshift in the rest-frame **ultraviolet**
  - The reddening of a galaxy or clumps within galaxies are poorly constrained without **ultraviolet** data at z=0.5---1.3 and optical data at z<2.5
  - Rapid quenching of star formation results in luminous **ultraviolet** and faint Halpha
  - Photoz redshifts significantly improved with **ultraviolet** data
- Ian Roederer, Jason Tumlinson, Steve McCandless, Kevin France: same pressing need for **ultraviolet**

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- HabEx starshade: > 2500 Angstroms.
- This is the fake ultraviolet. This will not satisfy the community that needs an astrophysical observatory.
- An astrophysics observatory requires real ultraviolet capability, i.e., at least as good as HST (i.e., down to 1150 A) and preferably extending into the FUSE range (down to 1000 A or even the Lyman limit).

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- But, since you asked, some of us would like to be diffraction limited in the ultraviolet. Thanks!

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4. OBSERVATORY VS. FOCUSED MISSION

- **Support from the astrophysics community requires <u>observatory capability with breadth</u>.**

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