Technology Overview

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Technology Today

- A flagship mission would look very much like Hubble.
- MgF2 coatings (practical limit of 1150 angstroms for routine observations)
- MCP based detector (improved from COS, 1997)
- UV/Vis Cameras based on CCDs with high QE (maybe two cameras with dichroic split)
- NIR would use Hawaii IR FPAs.
- Due to warm mirror, bandpass 0.115 to 1.8 microns

Where are improvements possible?

- Mirror reflectivity to Lyman limit (91 nm)
- Higher QE in NUV/FUV
- Multi-object in the UV
- High data rate to ground to support all instrument modes

Things are good

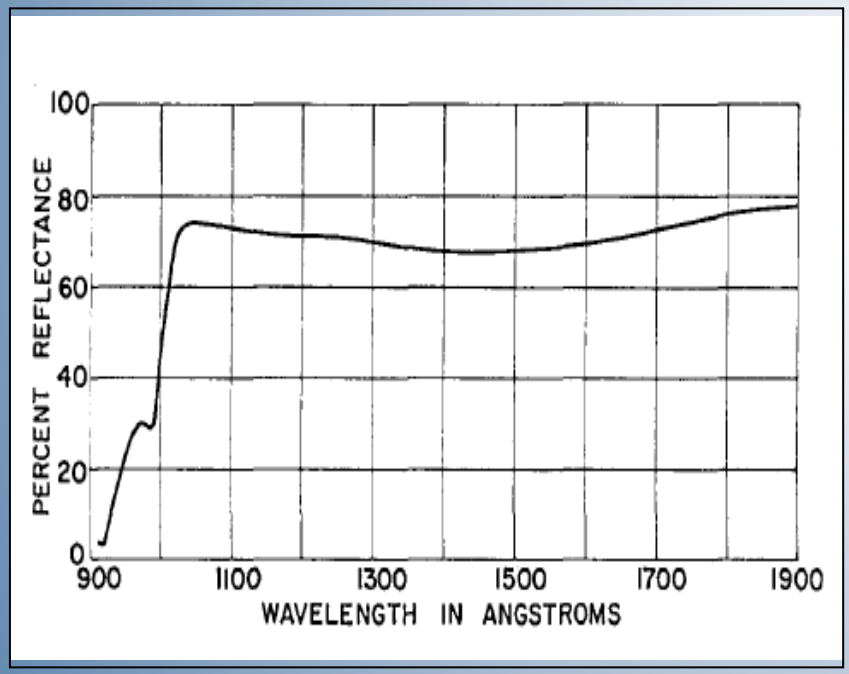
- CCDs are low noise and high QE
- MCPs are good for photon starved science case
- Improved NIR (1 – 1.8 microns) detectors
- We're much better at large FPAs (gigapixel arrays in use today)

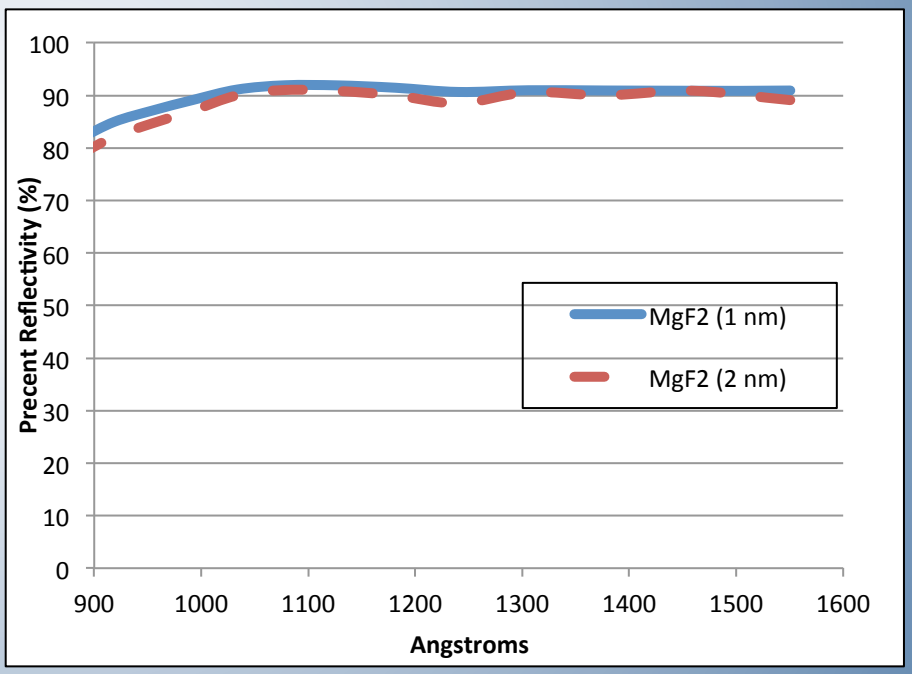
Big tech changes

- Improve coatings – go slightly bluer (to Lyman limit) and don't comprise the Vis/NIR bandpass
- Photon counting to other applications (as needed – exoplanets)

Why potentially revolutionary

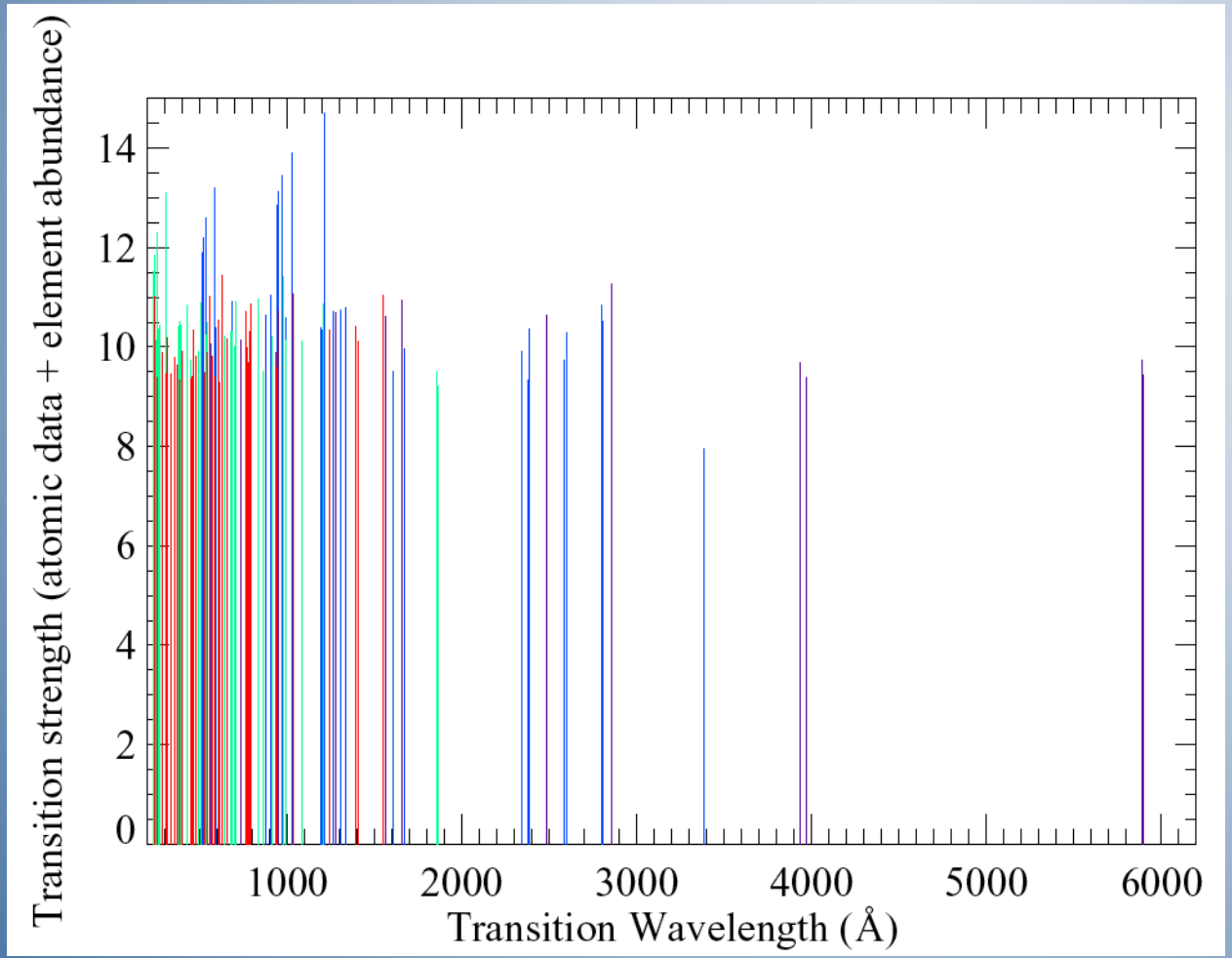
There is substantial room for improvement without invoking new reflective materials or new physical processes.





Hunter 1971 (17 nm) LiF/Al compared to the predicted reflectance of Al with 1 and 2 nm thickness MgF_2 (CRC, Henke et al. 1993)

Strongest Resonance Transitions Detectable in Interstellar/ Intergalactic Gases (Verner, Tytler & Barthel 1994)



- **Purple: neutral gas (trace species)**
- **Blue: neutral gas (dominant ion)**
- **Cyan: warm, (intermediate ionization) plasma**
- **Red: highly ionized plasma**

Thanks to Todd Tripp

What should the priorities be?

- Continue improving MCPs and solid state detectors.
- Large, significant gains possible from coatings at the shortest wavelengths
  - Goes beyond effective area, more complex instruments offer enormous increase in science output
- Data rate – from L2, a large mission will use all the Ka band downlink quite quickly.
  - Laser communication as a high heritage system