

## Hubble Space Telescope

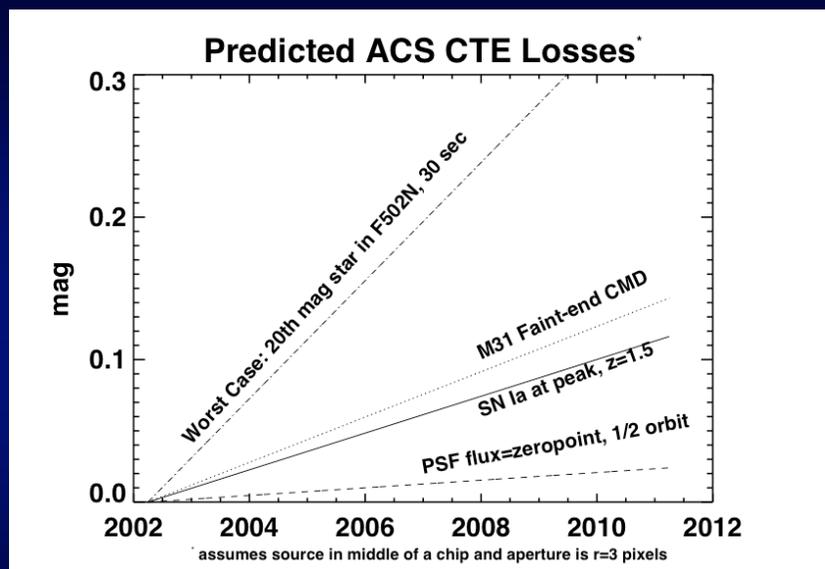
- Current health
- Servicing mission 4
- Multiple-facility proposals
- Things to think about...

## Cycle 15 Large Programs

Clarke	Comprehensive Auroral Imaging of Jupiter and Saturn during the International Heliophysical Year
Dalcanton	An ACS nearby galaxy survey
Brown	The Formation History of Andromeda's Extended Metal-Poor Halo
de Jong	The Nature of the Halos and Thick Disks of Spiral Galaxies
Carter	An ACS Treasury survey Coma cluster of galaxies
Cook	A Cepheid distance to the Coma cluster
Riess	SHOES-Supernovae, HO, for the Equation of State of dark energy

## HST Status

- 4 working Gyroscopes (2 in use)
  - Work is underway to enable 1-gyro operations
- WFPC2, FGS, NICMOS & ACS working
  - ACS, WFPC-2 CTE degradation
- STIS is inactive
  - Possibility of reviving on SM4 being investigated
- Batteries are probably the life-limiting item
  - 2009-ish



Expect uncertainty to be  $\sim 25\%$  of the correction

## Hubble Legacy Archive

- Fast access
  - Seconds not hours or days
- Composite images
  - stacked calibrated drizzled images, mosaics
- Improved Astrometry
  - better cross-matching, smaller error boxes
- Footprints
  - what observations exist; easier way to browse and download
- Cutouts
  - super-fast access; enable real-time services to be developed
- Source Catalogs
  - quick look facility, allow many users to skip the “analysis” step and go straight to the “interpretation” step

## HST science with no SM4

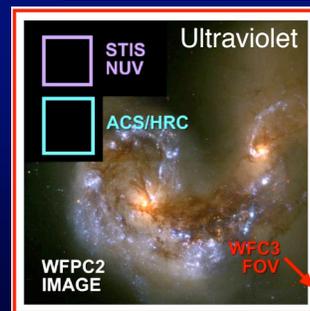
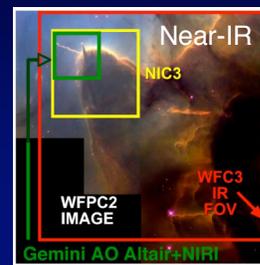
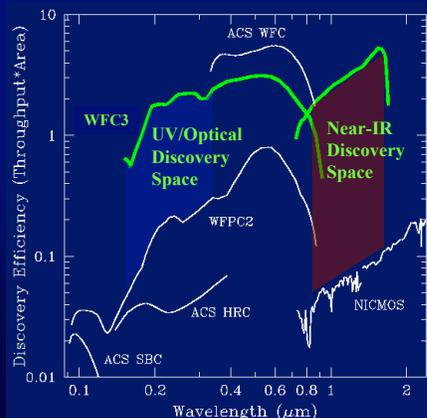
- Launch in early 2008?
  - Shuttle problems are the biggest worry!
  - If the shuttle can't get there, we have 3-5 years left
- Are there things we might regret having not done?
- Perhaps we should have a special TWMRHND category?

## Possible TWMRHND projects...

- Survey of the Coma Cluster, Survey of nearby galaxies?
  - Got time this cycle...
- Ecliptic pole surveys?
  - Continuous viewing zones for Spitzer, JWST, Akari
- Deep fields with favorable AO guide stars?
- Better photometric or astrometric calibration?
- UV imaging (of what?)
- More host galaxy morphologies of SNe, GRBs?
- $H_0$  to 5%?
- First-epoch observations for long-term astrometry?

## Adding WFC3

- Capabilities
  - Imaging from 2000 Å to 1.7  $\mu\text{m}$
  - Slitless spectroscopy
- Huge improvement in near-UV, near-IR imaging

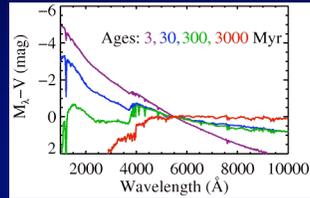


# WFC3 Science

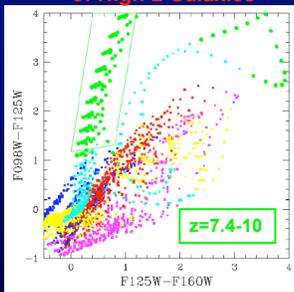
**Take advantage of dark IR sky in space:**

- High-redshift galaxy formation
- Sources of cosmic re-ionization
- Dust enshrouded star formation
- Water and ices in the solar system
- High-redshift supernovae as dark-energy probe

**NUV Observations  
Probe Age of Stellar  
Populations**



**IR Color-Color Identification  
of High-z Galaxies**



**Uniquely capable in the NUV, unmatched  
by any other planned mission:**

- Star formation history of galaxies
- Chemical enrichment history of galaxies
- Lyman-break galaxies at  $z = 1 - 2$
- Probe one of the darkest spectral regions of the natural sky background ( $\sim 200$  nm)

**Optical: Complement ACS with new,  
undamaged CCDs, with improved  
Charge-Transfer**

# Adding COS

COS greatly expands Hubble's spectroscopic capability in the Ultraviolet



Performance Metric	COS G130M/ STIS G140M	COS G130M/ STIS E140M	COS G160M/ STIS G140M	COS G160M/ STIS E140M
Effective Area	6	22	14	28
Eff. Area x Bandpass ("Discovery Efficiency")	32	11	72	14
Time to achieve same S/N	1/32	~1/20	1/72	~1/28



## Multi-Observatory science The problem

Each Great Observatory has a limited ability to allocate time on other Gobs

	Chandra	HST	Spitzer
Chandra		100 orbits	125 hours
HST	400 ksec		125
Spitzer	400	90	

These allocations are well suited to small science programs *or* medium and large programs that focus primarily on one wavelength regime, with supplementary observations at other wavelengths.

Medium and large “balanced” programs don’t fit well in this paradigm

Increasing these cross-observatory allocations is not practical.

Spitzer has 2 Cycles with full cryogen → need to address this issue soon

## A possible (tentative) solution

### New category of proposal - Great Observatory proposal:

- Science program *requires* major allocations of time on at least two GObs
- Proposals are reviewed by a separate Joint-Proposal TAC in a process running in parallel with the standard Observatory TACs

### How might this work?

1. Letter of intent required for each proposal by mid-November– identify science areas and allow us to constitute TAC with relevant expertise
2. Proposal deadline coincides with HST deadline (late January)
3. Proposals are submitted to each appropriate GObs using standard submission process
4. GObs TAC meets 7-10 days before HST TAC
5. Time available is a subset of the Large Proposal allocation
6. TAC can a) accept; b) pass on submitted proposals to the appropriate standard TAC; c) reject(?)
7. TAC provides a ranked list of recommendations to the directors of the three Great Observatories

## Caveats & addenda

1. A separate Joint-Proposal TAC cannot weigh the scientific potential of GObS proposals against the Large proposals submitted to the individual observatories → aim to include at least one member from each Observatory TAC on the Joint-Proposal TAC.
2. A separate TAC process is only feasible if the number of proposals is relatively small (<20 for a 1-day meeting).
3. A separate TAC *meeting* demands a minimum threshold for the number of proposals → but the TAC could meet by video-conferencing.
4. What access should the Joint Proposal TAC have to NOAO time?

*Full details need to be developed, in consultation with User Committees, and approved by appropriate directors*