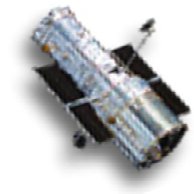
Hubble Facts

HST Program Office

Goddard Space Flight Center
Greenbelt, Maryland 20771



Advanced Camera for Surveys (ACS)

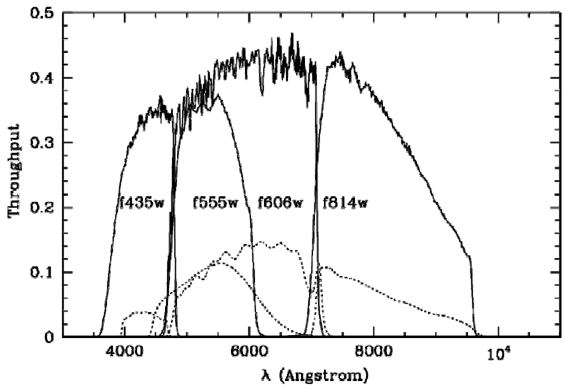
Essentials of the Instrument:

Installed on HST	**Mar. 2002 (SM3B)**
Function	**Wide-field imaging, high-resolution imaging, grism spectroscopy, coronagraphy, polarimetry**
__ range	**1200-10000A**
Optical Elements	**Filters, grism, prism, polarizers**
Detectors	**4096^2 CCD, 1024^2 CCD, 1024^2 MAMA**
Field(s) of View	**202^2, 26^2, 31^2 arcsec, resp.**
Scale (arcsec/pixel)	**0.05, 0.027, 0. 031 arcsec, resp.**
Enhancement factor over predecessor instrument (if any)	**10x over WFPC2**
Cost	**$75M**
Current status/health	**Operational, excellent**

Capabilities of ACS

ACS is a three-channel imaging camera whose hallmark capability—achieved with a 4096^2 pixel CCD—is wide-field imaging with optimized throughput and a better than half-critically sampled PSF at 8000A. The combination of throughput and field of view (FOV) provides ACS a 10x "discovery efficiency" advantage over WFPC2 for survey work at this wavelength. A second, 1024^2 CCD provides higher resolution imagery over smaller fields and greater responsivity at blue wavelengths. The third channel utilizes a STIS spare far-ultraviolet (FUV) MAMA (multi-anode microchannel plate array) detector to provide high throughput FUV imaging. A wide array of filters supports the three imaging channels, in addition to which a grism provides low resolution slitless spectroscopy, and an aberrated beam coronagraph mode in the small CCD provides optical band high contrast imaging.

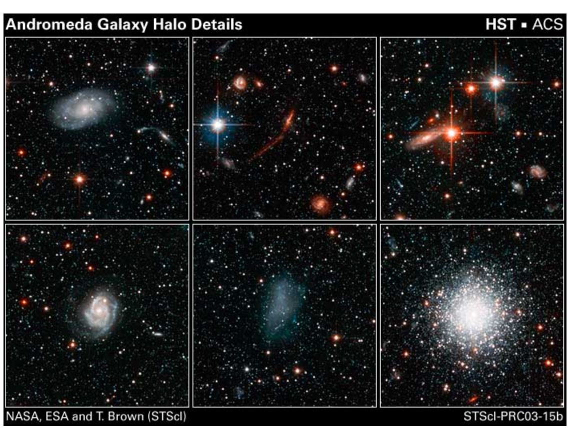
The figure below is an ACS vs. WFPC2 comparison of end-to-end system throughput through several standard wideband filters. Upper traces are for the ACS wide-field channel, and the lower are for WFPC2. Although the 2.3x FOV advantage for ACS is not included in the figure, it evident that a large discovery advantage for ACS is not confined to the I-band at ~8000A.



Putting the performance gain in real terms, the high system throughput for ACS and the excellent read noise characteristics (~ 5 e- for both CCDs) mean that Hubble Deep Field (HDF) depth can be achieved with ACS in the Wide-Field Channel in approximately 25-33% of the total exposure time required by WFPC2.

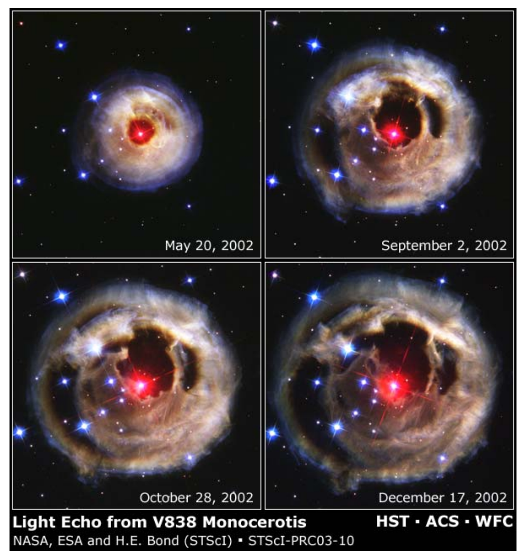
Science Highlights

ACS has been fully operational for only ~ 14 months and already has provided impressive scientific results. The age and star formation history of the M31 halo have been determined by observing to faint limits never before achieved on HST, approximately a full magnitude fainter than



HDF depths. Modelling of the color-magnitude diagram suggests a complex star formation history, with metal-enriched intermediate age stars accompanying a much older, metal-poor population, suggesting that a merger event took place ~ 6-8 billion years ago between the original old halo and a younger stellar assemblage.

Exquisite ACS imagery have recently revealed the detailed structure of material previously ejected from an eruptive variable star, made visible by the light echo from a 1.E4 luminosity increase in the star. These are but two of the spectacular results coming from ACS.



ACS Status and Prospects

Although the instrument is performing spectacularly, the large CCD is accumulating un-annealable hot pixels at a higher-than-expected rate, and its charge transfer efficiency is degrading (as expected) due to bombardment by energetic particles. The Aft Shroud Cooling System (ASCS) planned for installation in SM4 will ameliorate the hot pixel situation and permit running the CCDs at their optimum temperature of 83C (in contrast to the current 76-77C) by dumping aft shroud heat overboard into space.