Hubble Space Telescope

Antonella Nota - Hubble Project Scientist & Mission Manager
Astronomy Working Group
October 26, 2010
& Space Telescope User Group
November 1st, 2010
Three tier review, using ESA’s current advisory structure:

- Astronomy Working Group - presentation on 10/26
- Space Science Advisory Committee - presentation on 10/28
- Science Programme Committee - presentation tomorrow

Steps 1-2 successfully completed.
Hubble continues having extraordinary scientific and cultural impact.

The scientific potential of Hubble is at an all time high after a very successful Servicing Mission 4 (SM4), with two new instruments installed, two existing instruments repaired and several subsystems replaced.

European interest in Hubble remains high (18% of Cycle 18 proposals).

Predicted Hubble lifetime: ~ 7 years after SM4.

Operation costs reduced to 3.3 MEuro/year.

- 15 personnel deployed at STScI, as per NASA/ESA MOU,
9191 refereed papers to date, 3.27 x 10^5 citations
Hubble has discovered multiple main sequences in Globular Clusters. This discovery has shattered the paradigm that GCs are made of a simple, coeval, stellar population.

Color-Magnitude diagram of the GC Ω Cen from Hubble WFC3 images.
Pluto
new Hubble maps show
surface changes

Pluto: 30 AU or 3,000,000,000, 3 billion miles

ERIS: Sister of ARES the War God, ERIS is the Goddess of Strife and Discord.
Dysnomia (mythology), "Lawlessness" - a child of the mythological Greek goddess Eris.

Kepler - 1619
With the newly installed camera WFC3, Hubble has pushed the observational limit to galaxies that existed when the universe was just 600-800 million years old.

These galaxies were smaller in size and more irregular in shape than modern ones.
9.19 x 10³ published papers,
in 2009, 38% with European authors.
3.3 x 10⁵ citations.
a community of 5038 astronomers worldwide,
of whom 1502 European (30%) - Up by 15% since 2007.
Hubble’s public impact in 2009

# impressions = no. of stories x circulation

SM4

HST

5 billion

created over

newspaper and
internet article
impressions
HUBBLE - SCIENCE - EUROPEAN CONTRIBUTION

Authors from non-ESA member countries

Year

Number of Authors


0 1000 2000 3000 4000 5000 6000

First authors from ESA-member countries

Year

Number of Authors


0 50 100 150 200 250 300 350 400 450 500
HUBBLE - SCIENCE - PROPOSAL PRESSURE

GO Proposal oversubscription
GO Orbit oversubscription
AR Funding oversubscription

Cycle

Oversubscription Ratio

10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0

Cycle

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Cycle 18

- 1051 proposals submitted
- 189 proposals submitted with European PI = 18%
- 23096 orbits requested
- 4516 orbits requested by European PIs = 20%

2600 orbits available => oversubscription by 11:1
HST Archive Users

total in 2009: 7,900

IAU members: 9,260
AAS members: 7,700
In occasion of the 20th anniversary of the Hubble launch, the “Google Doodle” was dedicated to Hubble.
Conference “Science with HST 3” held in Venice, Oct. 11-14.

Sponsored by ESA.

~200 participants.

Goals of the conference:

• Celebrate 20 yrs of scientific breakthroughs of the Hubble Space Telescope and its impact on science and society.

• Discuss Hubble’s scientific future.
Hubble Exhibit at Palazzo Loredan, Venice [15/9 – 17/10].

Sponsored by ESA, with NASA participation.

Free access to the public.

Exhibit included images and Hubble-related hardware (astronaut tools and a large fragment of solar array flown).

Large public impact: ~12000 visitors (~380/day), including numerous schools.
Tutti pazzi per Hubble, il telescopio
Centinaia di studenti nelle sale dell'Istituto Veneto
Instruments:

- Based on experience with previous Hubble Instruments, the projected time until there is no imaging or spectroscopy on Hubble is 9.4 years (50% probability).

- Fine Guidance Sensors: 11-14 years, even in case of one failure.

- Gyros: transition to 2-gyro mode probable after ~6 years. Operations in 1 gyro mode possible for more than 10 years.

- Batteries: expected to last well in the 2020s.

Expectation is ~7-8 yrs of useful scientific productivity.
ESA contributes 15 scientists to the Hubble SOC (STScI)

- 30% of the total # of scientists supporting Hubble,
- mostly deployed in instrument calibration and user support.

- ESA maintains and supports some remaining Hubble hardware - Solar Array Drive Mechanism and Electronics
The European community has guaranteed access to a minimum of 15% observing time on Hubble.

The European community’s scientific interests are represented on the User Group (STUC), on the Time Allocation Committee (TAC) but also on the STScI oversight bodies (STIC).

Approximately 200 European astronomers have served on the TAC.

More than 60 European astronomers were employed by ESA at STScI: most returned to Europe, bringing know-how and scientific connections to their European institutions.

More than 200 European students and visitors have spent time doing research at STScI.