Science Vision in FY12-FY14 Will Increase HST Science Productivity

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<th>Year</th>
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<td>FY12-13</td>
<td>19-20</td>
<td>Complete Multi-Cycle Treasury Programs</td>
<td>In progress, on schedule</td>
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<td>FY14</td>
<td>21</td>
<td>Begin Ultra Deep Fields Observing Initiative</td>
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<td>FY14</td>
<td>21</td>
<td>Begin UV Astrophysics Legacy Program</td>
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<td>FY13-14</td>
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<td>Create HST Source Catalog</td>
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<td>FY13-14</td>
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<td>Develop Enhanced Archival Products</td>
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- Each of these initiatives will significantly increase HST scientific productivity.
- New initiatives represent a small fraction of the broad, diverse observing program selected through the standard yearly call for proposals.
Is the Hubble Ultra Deep Field Typical of the High Redshift Universe?

Hubble Ultra Deep Field WFC/IR

z ~ 7-8

NASA, ESA, G. Illingworth, and the HUDF09 Team

z ~ 10

UDFj-39546284
Ultra Deep Fields Initiative

- Fundamental relationship between galaxies and dark-matter halos

- Cosmic variance + luminosity/stellar mass functions
  - Do all halos above a given mass contain galaxies?
  - How does star formation ramps up in early galaxies?

- 750-1000 orbits of Director’s discretionary time to produce another complete (blue-IR) UDF and begin 3-4 more at blue wavelengths

- STScI will produce fully reduced science products for the community

- Coordinate with Spitzer, Chandra, ALMA, JWST scientific return

- Community participation in field selection
Deep Fields Working Group

• Convene science definition working group
  – WG will define/refine key science questions to be addressed
  – WG will meet mainly via telecon, but may also meet face-to-face
  – WG will focus on science, but may also consider implementation strategies
    • Formal implementation team will take over after WG concludes
  – WG will solicit input from the science community
  – WG product will be a white paper with science case by end of summer
  – WG will report to STScI Director
  – WG logistics will be handled by HSTMO/SMO

• Working group composition
  – Chair + 8-10 members
  – Member pool drawn from:
    • Suggestions from senior HST deep fields investigators
    • 1 Spitzer representative, 1 Chandra representative, 2 STScI (HST, JWST) representatives
    • Suggestions from STUC
  – Composition will be constituted with diversity and future vision in mind
  – Composition will be determined by STScI Director in consultation with HSTMO, SMO, and STUC
• ACS, COS, STIS, and WFC3 all have powerful ultraviolet observational capabilities.

• HST’s UV capabilities won’t be reproduced in the foreseeable future.

• Community uses UV capabilities, but we can take simple steps now to ensure full legacy value for years to come.
HST archive now contains hundreds of COS spectra of quasars like the one shown below.

Tumlinson et al. 2011

J1009+0713  $z_{\text{QSO}} = 0.456$

Target (HI + OVI)

HI + OVI

DLA + metals

LLS

Tumlinson et al. 2011
Ultraviolet Astrophysics Legacy Program

• Initiative has two goals
  – New observing programs to lay the foundation for current and future science programs that will depend on UV data
  – Enable users to develop tools/products that can better exploit archival UV data

• TAC will allocate up to 50% of available Large/Treasury program time (~500 orbits/cycle) to UV Astrophysics Legacy programs in Cycles 21-23
Ultraviolet Astrophysics Legacy Program

- Hubble has unique observational capabilities at ultraviolet wavelengths (90-350 nm) that won’t be reproduced in the foreseeable future

- Proposals must be scientifically meritorious and of high value to future HST archive users
  - Proposals submitted through standard call for proposals
  - Can propose new observations and/or archival research

- Proposers must commit to producing tangible high-level science products for the HST archive
  - Example HLSP: image mosaics, combined spectra, fully-extracted grism spectra, catalogs of ultraviolet objects and their properties
  - HST archive presently has very few HLSP for ultraviolet data

STUC - April 2012
Enhanced Science Products are in Great Demand

- Example: Multi-Cycle Treasury program high-level science product downloads are already 20x greater than available data volume.