STUC (November 2012)

New Leadership

Science highlights

Budget issues

NRO telescope
(if we have time)
Kathy Flanagan
Deputy Director
Hussein Jirdeh
Office of Public Outreach

David Liska
Information Technology Services
In support of New Horizons, Hubble discovers a fifth moon orbiting Pluto

significant trajectory adjustments now required
Atmospheric evaporation in exoplanet due to a stellar flare

Simulation of HD 189733b

X-ray flare

Swift & HST/STIS

Lecavalier des Etangs et al 2012

Simulation: NASA, ESA, L. Calçada, Solar Dynamics Observatory
Lensed images of a candidate $z \sim 11$ galaxy

Coe et al. submitted to ApJ
CLASH candidates at $z \sim 9.6$ and $10.7$ in 78 arcmin$^2$ are consistent with observed $z \sim 8$ luminosity function (Bradley12) lensed and extrapolated to higher redshifts.

But in ‘tension’ with field results which suggest a sharp drop off in star formation rate density in the < 200 Myr between $z \sim 8$ and 10

- could be an even richer Universe for JWST
The diagram shows the number of news articles mentioning XDF and JWST over the period from 09/23/2012 to 09/27/2012. The release of HST is indicated by a peak in the graph, with a corresponding peak for JWST. The number of news articles mentioning XDF and JWST is measured along the y-axis.
JAMBOREEE!
Monday, July 16
11 AM - 1 PM

Exploring the Synergy Between the:
Office of Public Outreach
Hubble Heritage
Citizen Science
& The Hubble Archive

- Watch the creation of a Hubble Heritage image!
- Make your own color image using the Hubble Legacy Archive!
- Watch the creation of a 3-D image!
- Try your hand at one of the Citizen Science Projects!
- Consider submitting an EPIC grant associated with your cycle 20 Hubble proposal!

Light refreshments will be served!
starting at 10:30
http://hla.stsci.edu/citizen_science/Citizen_Science.html

Hubble Heritage
Working Group
Hubble Archive
Citizen Science
“At this stage, we're looking at Hubble telescope-length distances between campaign ads and reality”.

GM Spokesman Greg Martin
- 30th Oct 2012
Instruments operating normally

(see Ken Sembach’s presentation)
NIRCam A&B modules at LM test facility

NIRSpec instrument being reassembled

FGS/NIRISS completing its CV testing

MIRI now at GSFC

Instruments and ISIM integration and test under way

primary mirrors complete and ready for shipping
# James Webb Space Telescope Program FY12 Milestones

<table>
<thead>
<tr>
<th>Month</th>
<th>Milestone Description</th>
<th>Status</th>
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<tbody>
<tr>
<td>Apr ’12</td>
<td>Receive Flight Mid-infrared Instrument (MIRI) from Europe, first of the telescope’s four science instruments</td>
<td>Received 5/29</td>
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<td>Complete Critical Design Review for Sunshield Support Structure</td>
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<td>Complete all composite parts for mechanism that lifts telescope away from spacecraft after launch (Deployable Tower Assembly)</td>
<td>Completed 3/21</td>
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<tr>
<td></td>
<td>Complete all composite parts for mechanism that lifts telescope away from spacecraft after launch (Deployable Tower Assembly)</td>
<td>Completed 2/28</td>
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<td>May ’12</td>
<td>Finish testing the COCOA</td>
<td>Completed 3/9</td>
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<td></td>
<td>Measure Sunshield template layer 5 shape to confirm its accuracy</td>
<td>Completed 4/23</td>
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<td></td>
<td>Conduct budgetary and schedule review of initial program and project performance since completing the 2011 replan</td>
<td>Completed 5/30</td>
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<tr>
<td>Jun ’12</td>
<td>Complete modifications of JSC TVC</td>
<td>Completed 6/30</td>
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<td></td>
<td>Complete Critical Design Review for telescope-ground communications system</td>
<td>Completed 6/13</td>
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<td></td>
<td>Complete Preliminary Design Review for equipment that tests Sunshield deployment</td>
<td>Completed 6/21</td>
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<tr>
<td></td>
<td>Complete designs for structures that will hold telescope inside JSC TVC</td>
<td>Completed 6/28</td>
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<tr>
<td>Jul ’12</td>
<td>Reach agreement with Program Office on FY13 spending plan</td>
<td>Completed 7/10</td>
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<td>Deliver Flight Fine Guidance Sensor</td>
<td>Completed 7/30</td>
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<tr>
<td></td>
<td>Deliver Flight Fine Guidance Sensor</td>
<td>Completed 5/11</td>
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<tr>
<td></td>
<td>Deliver Flight Fine Guidance Sensor</td>
<td>Completed 6/14</td>
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<tr>
<td></td>
<td>Deliver Flight Fine Guidance Sensor</td>
<td>Flight CHA to be delivered in June 2013. No schedule, impact, work around in place.</td>
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<td>Complete Solar array Preliminary Design Audit</td>
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<td>Deliver MIRI Cryo Cooler “Cold Head Assembly” (critical component of MIRI cooling) to ISIM I&amp;T</td>
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<td>Complete fabrication of end fitting for Secondary Mirror Support Structure</td>
<td>Completed 7/13</td>
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<tr>
<td>Aug ’12</td>
<td>Order remaining JSC thermal vacuum chamber vibration isolators</td>
<td>Completed 8/9</td>
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<tr>
<td>Sep ’12</td>
<td>Deliver NIRCam</td>
<td>Moved to 12/2012, work In progress</td>
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<td></td>
<td>Deliver telescope simulator for ISIM I&amp;T</td>
<td>Completed 8/9</td>
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<tr>
<td></td>
<td>Start testing of cryogenic camera system, used for subsequent JSC I &amp; T</td>
<td>Completed 3/28</td>
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<td>Complete center section of Backplane Support Structure for main mirror</td>
<td>Delivery date 4/2013.</td>
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<tr>
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<td>Deliver NIRSpec</td>
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</table>
Program still has 14 months of funded schedule slack
Short term THREATS

to HST

➡ Senior Review confirmed expected OPS budget ✓

but pressure to reduce to GO program

pressure to reduce the Hubble Fellows program

to JWST

➡ President’s FY13 Budget Request gives ideal profile ✓

➡ House and Senate are supportive ✓

sustaining the budget, schedule the $8B cap under a CR ✓

but Sequestration
To meet a 2018 launch, and stay within a $8B cap requires funding above the FY12 level for FY13 - FY17.

Note: NGAS total $1.8B, NASA’s internal cost models estimate $4.9B to launch. Contains ~ $1B of uncommitted reserves.
HST & JWST Budgets

Budget ($)M

2010 2011 2012 2013

JWST-P

HST-P

STScI
New Telescope Meeting
September 4–6, 2012 Princeton, NJ

The NRO has gifted NASA two "Hubble class" telescopes. How should the astronomy community best use these facilities?

What is the most compelling science that can be done with these facilities at a reasonable cost? This workshop will explore opportunities for WFIRST science, UV astronomy, exoplanet searches and other astronomical applications.

Hubble Space Telescope

Live Webcast
Go to: www.princeton.edu/webmedia and it will be listed there about ½ hr. prior to start of event.

User name: NRO
Password: NEW
What Is the Hardware Being Considered?

- Available Flight Hardware
  - Two, 2.4m, two-mirror telescopes
  - Two outer barrel assemblies
  - One hardware radiator/electronics bays

- All ground support equipment for alignment, integration, and test
- Robust traceability has been retained for all flight hardware

2.4 m Telescope

- Optical Form: 2 Mirror, f/8
- Aperture: 2.37m
- Unvignetted Field of View: ~ 1.8° Dia.
- Wavefront Quality: <60 nm rms
- Secondary Mirror Assembly Control –
  - 6 DOF plus fine focus
  - 6 DOF Actuators are at the base of the secondary struts
  - Focus actuator is behind the SMA
- Mass: 840kg
- Back Focus: 1.2m behind PM Vertex
An NRO 2.4m telescope should provide a better DE survey program, if we could get the same FOV as DRM2, and we already have at least 3 “as is” concepts for the large imager array.

Total field of 0.375 degrees square.

27 4k x 4k arrays with 0.11 arcsec pixels

on Kepler focal plane
~ 10% of mission cost, so halving or doubling the number of arrays changes the mission cost by +/- 5%

An NRO 2.4m telescope should provide a better DE survey program, if we could get the same FOV as DRM2, and we already have at least 3 “as is” concepts for the large imager array.

Four focal planes utilizing 16 H4RG detectors (4x4k) each.

Guiding arrays on one focal plane only

Thompson
Hubble-like resolution across 2 x 0.375 square degrees 0.75 square degrees (0.7 - 2.0 microns)
Alan Dressler said,

“One more time: what was the idea behind WFIRST?

Was it really just a dark energy probe with a few bones thrown to exoplanet research, and to the astronomers who were mucking about in their gardens --- oblivious to the search for truth?

No, it was not. The EOS, and the Decadal Survey committee, embraced the notion that **GO science was the key feature** of the WFIRST program, recognizing that a modest-aperture wide-field near-IR telescope opened new opportunities across diverse fields of astronomy and astrophysics.

It would have been much simpler for the EOS to choose a couple of probe missions (in addition to enhancing the Explorer program) and be done with it, and the obvious candidates were dark energy and exoplanets. Why didn’t this happen?”

**WFIRST should be driven by the need for a broad GO program**
The EOS Panel of NWNH agreed with this assessment. Nevertheless, the Panel did not decide to dedicate a space mission --- like JDEM ---- to this endeavor. In some part, this was because of the limited benefit to the broad astronomical community if most (all) of the new-mission funding went to a “dark energy probe.”

However, this was not the only reason. The Panel agreed that two other factors prevented the proposal of a dedicated dark energy mission as the highest priority:

1) BALANCE: Already many other facilities engaged in this program: DES, PanSTARRs, BOSS, CFHT, Boss, Big-Boss, HET-DEX, Euclid, LSST... to name some major ones. How much of the available research resource should be allotted to this one program?

And don’t forget Subaru....
A multiplicity of coronagraphs - a lot of progress

$10^{-8}$ today in lab

$10^{-9}$ test on-orbit

a high-quality, stable 2.4m space telescope enables new Exo-planet science - no Explorer or Probe-class mission can reach this level of performance
• NASA has selected members of the Astrophysics Focused Telescope Assets SDT.
• 75 applications received from community, 17 people selected.
• Co-chairs are David Spergel (Princeton) and Neil Gehrels (GSFC).
• Charter is to develop baseline DRM for one of the telescopes to use “as is” and is technically viable for launch by CY 2022 (if funding starts at beginning of FY2017).
• And to include consideration of a coronagraph
• Overall mission cost is to be kept as low as possible while still achieving all or part of the science priorities for WFIRST.
• SDT will present their findings no later than April 30, 2013.
The Path towards Finding Earth 2.0

2016: OpTIIX on ISS
Planning, E/PO, Calibration, WFS&C

2017: TESS in HEO
Archive, GI program, E/PO

2018: JWST at L2
Full Science Operations

2021: NRO 2.4m in HEO (WFIRST+)
Shared Science Operations

2030+: ATLAST at L2
Full Science Operations

Now: HST in LEO
Full Science Operations