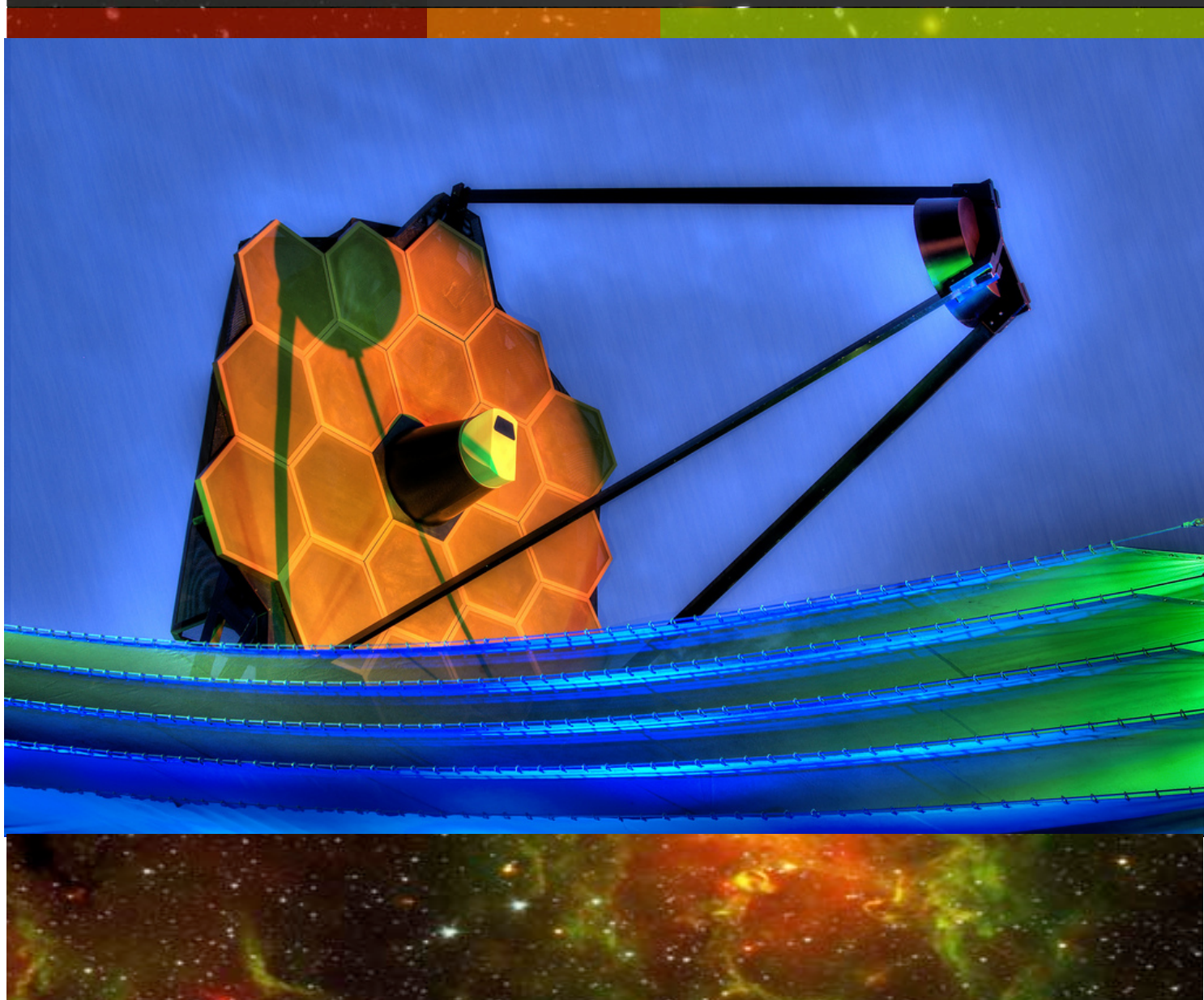
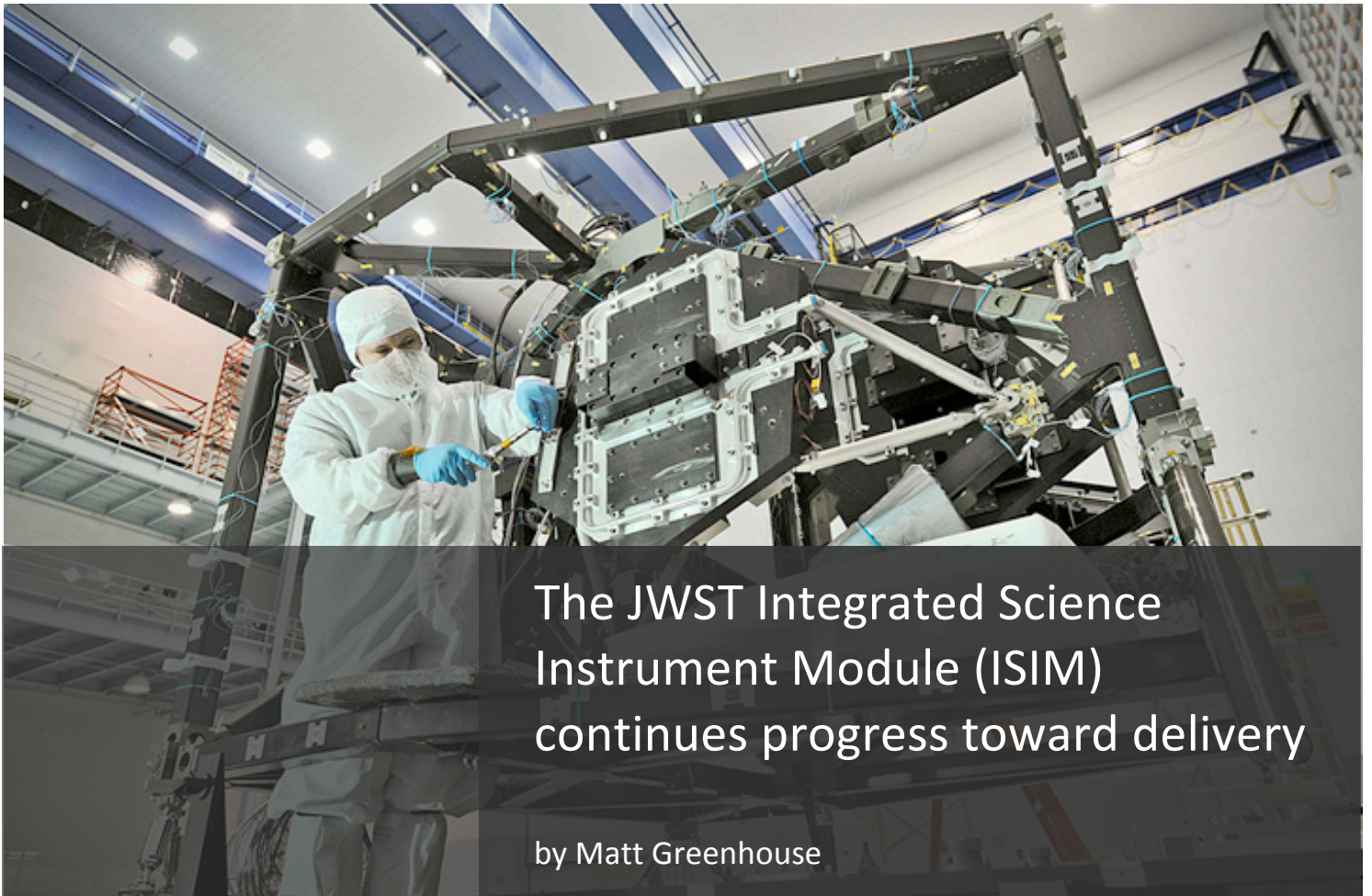


# Webb Update

Spring 2011







## The JWST Integrated Science Instrument Module (ISIM) continues progress toward delivery

by Matt Greenhouse

The JWST Integrated Science Instrument Module (ISIM) is the science payload of the JWST (see Greenhouse et al, 2010 Proc SPIE, 7131). Along with the telescope and spacecraft, the ISIM is one of three elements that comprise the JWST space vehicle. At 1400kg, it makes up approximately 20% of the observatory mass. In order to maximize efficiency with respect to mass, power, and nonrecurring engineering cost, the four JWST science instruments are not designed as traditional stand-alone systems; rather, the ISIM provides nine key subsystems that are shared by each of the science instruments (see Figure on p.5). These are:

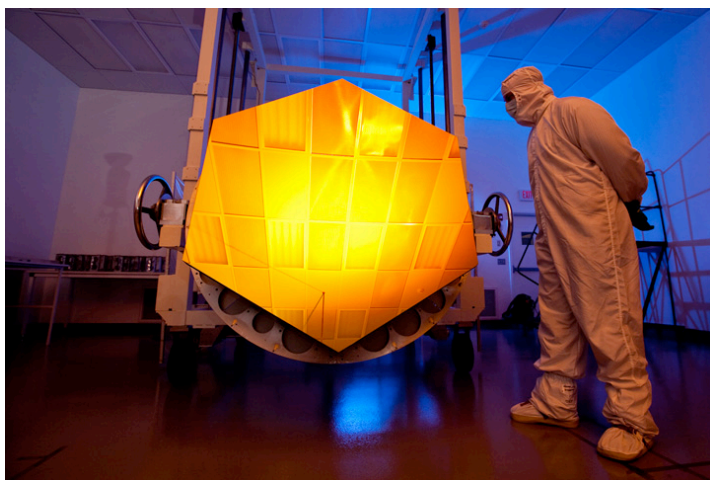
- [1] optical metering structure
- [2] ISIM Electronics Compartment (IEC)
- [3] harness radiator (HR)
- [4] ISIM Command and Data Handling System (ICDH)
- [5] ISIM Remote Services Unit (IRSU)
- [6] electrical harness system
- [7] thermal control system (TCS)
- [8] flight software system (FSW)
- [9] on-board script system (OSS).

The flight model build of the ISIM system is underway with all science instruments beginning flight model cryogenic performance testing this year.

All of the above subsystems are on schedule for delivery to ISIM I&T during 2011. The ISIM flight structure has completed cryogenic performance testing and will complete modal and ambient strength proof test during April. The flight IRSU has been delivered, and the ICHD, IEC, HR, and TCS are currently in integration. The FSW is in a mature build state including integration of all science instrument applications. The OSS completed its critical design review during December of 2010 and is on schedule to support ISIM I&T. Development of ground support equipment for ISIM system-level I&T is also on schedule. The Observatory telescope simulator (OSIM) has completed ambient testing and will begin cryogenic testing in during May.



Phil Sabelhaus, the former project manager, has transitioned to another mission at GSFC, the Landsat Data Continuity Mission, as the project manager where he will lead that team to a launch in 2012. We wish Phil the best of luck and thank him for his 8 years of leadership on the JWST program. Phil saw the project through its challenging definition and technology development phases and helped NASA create the sound hardware basis we are now seeing come to fruition.



## JWST Program Changes

by Eric Smith

Following the October 2010 receipt of the Congressionally requested Independent Comprehensive Review Panel (ICRP) report, NASA began to make changes to its JWST Program to address problems identified in the report. Program and Project management offices at HQ and GSFC respectively were elevated in the management reporting chain. The JWST Program Office headed by Rick Howard at HQ now reports to the NASA Associate Administrator (C. Scolese). At GSFC, new Project Manager Bill Ochs reports to the Center Director (R. Strain). Both of these moves will serve to bring JWST progress and issues to agency upper management in a regular and rapid fashion. It clearly elevates JWST to an agency matter, not just a GSFC or Astrophysics Division one.

The launch date and associated funding recommendations contained within the ICRP report were considered in the program replanning effort, but in this time of government-wide fiscal challenges, found to be unsustainable. Over the ensuing months the program has worked with its contractor teams to develop a new budget and schedule that will go through formal agency approval processes during the Spring and Summer. This new plan will be coordinated with the Office of Science and Technology Policy, the Office of Management and Budget, Congress and the JWST international partners.

To address the ICRP concern about visibility of science within the project NASA has added experienced Hubble Space Telescope Project Scientist for Operations Dr. Mal Niedner to the JWST science team as the Deputy Senior Project Scientist, Technical and members of this science team participate in the weekly dialog between the project and GSFC Center Director Rob Strain.

It is important to remember that during this extensive replanning period excellent progress has continued with JWST flight hardware. As this letter “goes to print” we are preparing for the final cryogenic testing of 6 primary mirror segments. All mirror segments have completed their polishing and meet the stringent requirements needed for JWST science. Science instruments will be arriving at GSFC in the Summer and Fall to begin their integration processes. 2011 will be a dramatic year for flight hardware deliveries as the program prepares to enter into its integration phase.



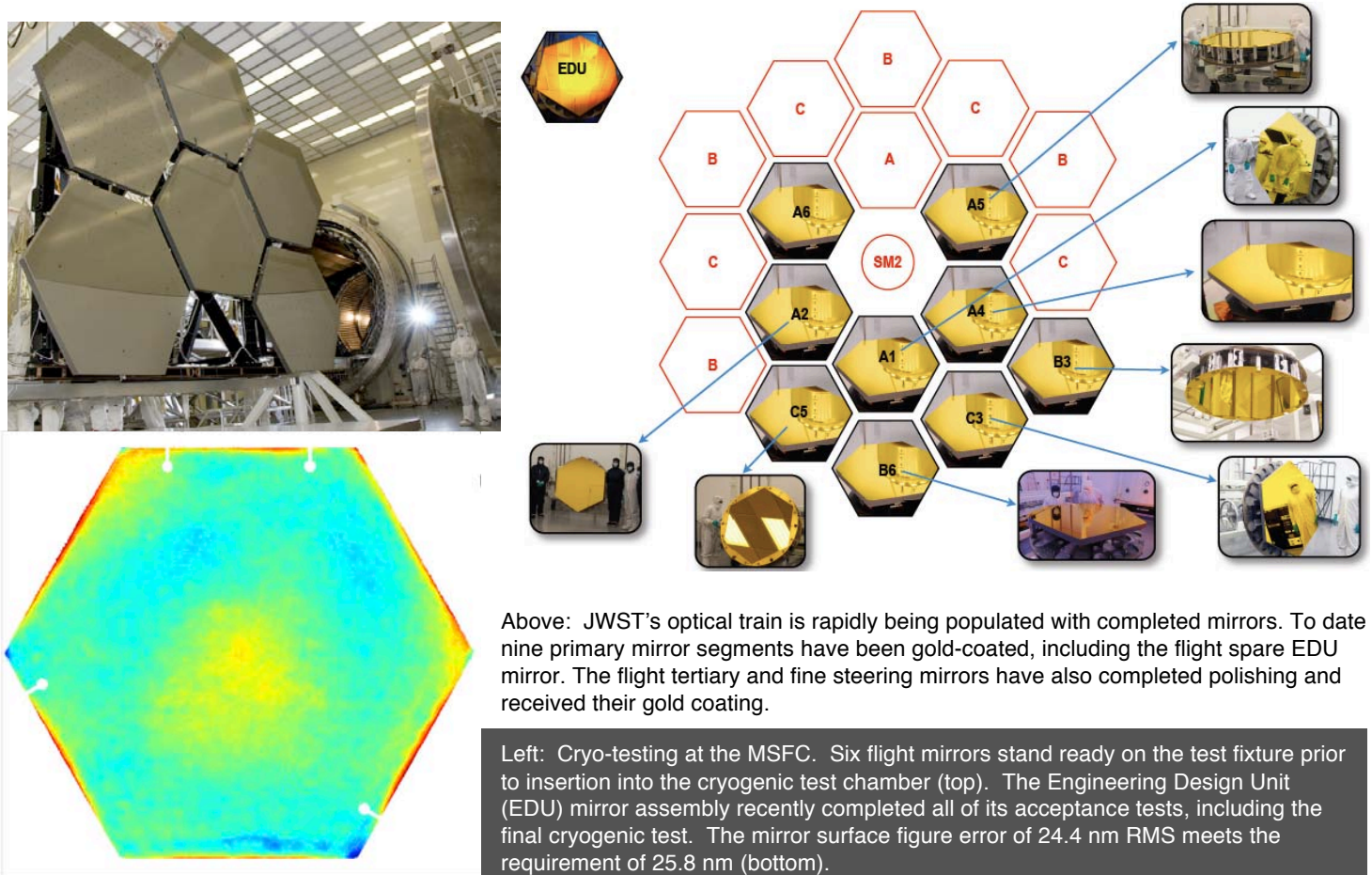
## Webb's Mirror: The Home Leg

by Mark Clampin

In the construction of any telescope completing the optics is a major milestone, and the Webb Space Telescope is no exception. With its segmented primary, there are many mirrors to polish, a total of 18 primary mirror segments, a secondary mirror, a tertiary mirror and a fine steering mirror. Webb's mirrors are especially challenging since the mirrors are polished at room temperature, but their optical prescription has to be correct at JWST's operating temperature of 40K. A polishing technique known as cryo-polishing is employed to address this challenge. Prior to the last stage of mirror polishing, as the figure quality reaches ~150 nm RMS, the JWST primary mirror segments are shipped to the Marshall Space Flight Center (MSFC), so that their cryo-distortion, the change in shape as the mirror cools from ambient to 40K, can be measured. Figure 1 shows six JWST primary mirror segments being inserted into the MSFC test chamber for their cryo-distortion testing. Once a mirror's cryo-distortion has

been measured, a final polishing prescription can be generated, so that each primary mirror segment will meet its required surface figure error of 24.5 nm RMS the next time it is measured at 40K.

Following the completion of mirror polishing, each segment is gold coated and then undergoes acceptance testing, which comprises 3-axis vibration followed by a final cryogenic test to verify its figure. The program is making excellent progress in completing flight primary mirror segments. To date, nine segments have completed polishing, with eight of these mirrors gold-coated. In addition, both the tertiary and fine steering mirrors have been completed. On the current schedule it is planned to complete polishing of the primary mirror segments by year's end. The first primary mirror segment assembly to complete acceptance testing is shown in Figure 3 and meets the requirements for its optical specification. Final acceptance cryo-testing of the next five flight mirrors is scheduled to begin in April 2011.

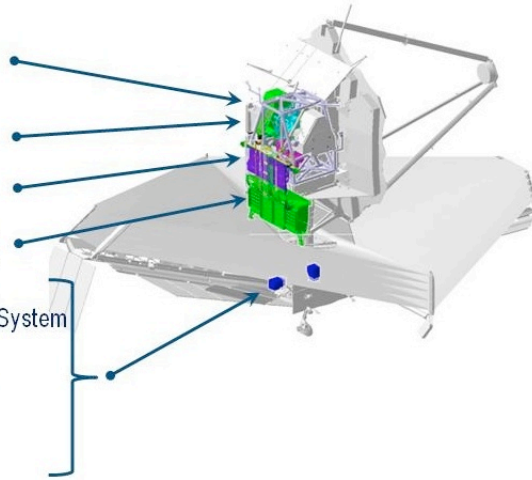


Above: JWST's optical train is rapidly being populated with completed mirrors. To date nine primary mirror segments have been gold-coated, including the flight spare EDU mirror. The flight tertiary and fine steering mirrors have also completed polishing and received their gold coating.

Left: Cryo-testing at the MSFC. Six flight mirrors stand ready on the test fixture prior to insertion into the cryogenic test chamber (top). The Engineering Design Unit (EDU) mirror assembly recently completed all of its acceptance tests, including the final cryogenic test. The mirror surface figure error of 24.4 nm RMS meets the requirement of 25.8 nm (bottom).

### The ISIM system consists of:

- Four science instruments
- Nine instrument support systems:
  - Optical metering structure system
  - Electrical Harness System
  - Harness Radiator System
  - ISIM electronics compartment (IEC)
  - Cryogenic Thermal Control System
  - ISIM Command and Data Handling System (ICDH)
  - ISIM Remote Services Unit (IRSU)
  - Flight Software System
  - Operations Scripts System



Would you like a colloquium at your university on JWST? How about a talk at a conference you are organizing? These JWST scientists are willing to give a talk. All expenses will be paid by the JWST project for talks in the US; talks in other countries can also be arranged.

To arrange a talk, please email [contactswg@jwst.nasa.gov](mailto:contactswg@jwst.nasa.gov) or contact the speaker directly.

For European universities and institutions interested in inviting speakers to give talks covering the full range of scientific topics addressed by JWST, please contact Peter Jakobsen (ESA JWST Project Scientist, ESTEC, [pjakobse@rssd.esa.int](mailto:pjakobse@rssd.esa.int)).

The speakers are also available to give JWST Mission Overview talks and talks at the general public level.

- Mark Clampin, GSFC, "Exoplanets with JWST"
- Rene Doyon, Universite de Montreal, "JWST Tunable Filter Science"
- Jonathan Gardner, GSFC, "JWST and Galaxy Evolution"
- Matt Greenhouse, GSFC, "JWST Mission Overview and Status"
- Heidi Hammel, Space Science Institute, "Planetary Exploration with JWST"
- John Hutchings, DAO, "JWST's Guider and Tunable Filter Imager"
- Jonathan Lunine, University of Arizona & University of Rome, "JWST, Exoplanets and the Solar System"
- John Mather, GSFC, "JWST Mission Overview and Status"
- Bernie Rauscher, GSFC, "JWST and it's HAWAII-2RG and SIDECAR ASIC Detector Systems"
- George Rieke, University of Arizona, "Debris Disks and the Evolution of Planetary Systems" or "The Place of JWST in the growth of Infrared Astronomy"
- Marcia Rieke, University of Arizona, "NIRCam for JWST: Exoplanets to Deep Surveys"
- Jane Rigby, GSFC, "Gravitationally Lensed Galaxies and JWST" or "AGN and JWST"
- George Sonneborn, GSFC, "Imaging and Spectroscopy with JWST"
- Massimo Stiavelli, STScI, "Studying the first galaxies and reionization with JWST"
- Amber Straughn, GSFC, "JWST and Galaxy Assembly"
- Rogier Windhorst, Arizona State University, "JWST and Reionization" or "JWST and Supermassive Black Hole Growth"