



The Critical PATH

2015 Winter Issue • A Flight Projects Directorate Quarterly Publication

Eyes on the Horizon: James Webb Space Telescope's Optical Integration

The James Webb Space Telescope team is preparing for a delicate operation on the observatory's eyes and spine this fall.

In late August, the team wheeled the telescope structure, part of the Optical Telescope Element (OTE), into the clean room at NASA's Goddard Space Flight Center (GSFC). The Webb telescope's mirrors have waited inside the clean room in pods for several years. In the coming months, GSFC engineers will fuse these components together.

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The telescope structure arrived at GSFC in August. Here, an engineer takes a look at it in the clean room.

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Landsat 9 – Continuing the Legacy

In March 2015, GSFC began work on Landsat 9, the next mission in the Landsat program, our longest continuous satellite record of the Earth's land environment. When launched in 2023, Landsat 9 will commence the second half-century of observations of Earth's forests, crops, urban areas, and other land features.

The origins of the Landsat program stretch back to the 1960s, when imagery from manned missions and military reconnaissance satellites first demonstrated the value of monitoring Earth resources from space. Since the launch of the first mission in 1972, the

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David Mitchell

Message from the Director

We had another very productive quarter in the Flight Projects Directorate. Recently the Magnetospheric Multiscale (MMS) and Deep Space Climate Observatory (DSCOVR) project office teams handed over mission operations to their receiving organizations (Space Science Mission Operations (SSMO) and the National Oceanic Atmospheric Administration (NOAA), respectively). This is the culmination of many years of hard work by many people. Congratulations to all involved. I'm looking forward to the years of scientific discovery that lie ahead.

On the new business front, we were informed by NASA Headquarters that Goddard and our partner organizations were selected for two Discovery class Phase A efforts. Five missions in total were selected, out of 27 competing teams, so the fact that Goddard was assigned two of these missions for Phase A is tremendous. We had three other Goddard Discovery proposal teams that were not selected, but I can speak from seeing all five of the Goddard proposals prior to their submissions, that they were all very competitive. Thanks to the teams for their efforts. Now it is on to the very intense competitive Phase A activity for both of these Discovery missions, along with a recently selected Astrophysics mission. In addition to these activities, there is a whole host of other exciting new business efforts in the early formulation phase including Wide Field Infrared Survey Telescope (WFIRST), Pre-Aerosol, Clouds, and ocean Ecosystem (PACE), Landsat 9, and various instrument developments.

While the early work noted above is very important to our future, so too are our missions running to launch over the next year and a half. After a quiet launch period in the latter half of 2015, we are gearing up for a busy period where we will support the ASTRO-H launch in Japan, and many launches from the U.S. including Raven, Space Environment Testbed-1, Neutron star Interior Composition Explorer (NICER), Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx), Joint Polar Satellite System (JPSS)-1, and Geostationary Operational Environmental Satellite (GOES)-R. These are very exciting times for the teams as they finish their work in integration and test, and then ship to the launch sites. Please make sure to help your teammates along the way as we do our final "dotting of the i's and crossing of the t's." I also want to acknowledge the efforts of the Tracking Data Relay Satellite (TDRS)-M team in getting that spacecraft completed and "in the bag," as it now waits to be called up for launch and on-orbit service in the next couple years.

I'd also like to thank everybody who supported the "Explore@NASAGoddard" open house on Saturday, September 26. Vastly exceeding our expectations, there were over 20,000 people who showed up to tour our Center and meet the outstanding people working at Goddard. The enthusiasm from the volunteers was infectious. I loved seeing all the young families touring Goddard; that to me is how we really reach out to the next generation of explorers.

Lastly, I want to wish everybody a happy and healthy holiday season with your families and friends. I'm looking forward to a very exciting 2016 with the FPD team!

Dave

David F. Mitchell
Director, Flight Projects
david.f.mitchell@nasa.gov

Personality Tintypes

Tom McCarthy



Tom McCarthy

Tom is the newly selected Deputy Director of Flight Projects. In this role, Tom shares oversight responsibilities with Dave Mitchell, the Director of Flight Projects for a flight projects portfolio of \$3.3B that encompasses 27 projects in development and 42 missions in operations.

Born

Philadelphia, PA

Education

Bachelor's Degree in Mechanical Engineering, Gannon College, Erie, PA

Master's Degree in Mechanical Engineering, Villanova University, Villanova, PA

MBA, International Business, Philadelphia College of Textiles and Science, Philadelphia, PA

Life Before Goddard

Tom McCarthy has 36 years of experience in the aerospace industry with more than half this time spent with General Dynamics/Lockheed Missiles & Space/General Electric/RCA/Martin Marietta/Lockheed Martin in the thermal systems as well as the systems integration and test disciplines. Tom left the big company world in 1997 to work a turn-around opportunity as the General Manager (GM) of small technology company in Hunt Valley, MD. This small technology company, called Dynatherm Corporation, Inc. (DCI) designed and manufactured thermal control systems and devices (heatpipes and loop heatpipes) for satellite systems. Tom and his DCI team led the introduction of the Russian loop heatpipe technology into the U.S. aerospace market enabling the growth of communication payload heat rejection capability through large deployable radiators for commercial satellites. During his tenure as GM, Tom led the company through two corporate sales of the company. This was an exciting

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Amber Jacobson



Amber Jacobson

Amber is the Senior Education and Public Outreach (EPO) lead for the Exploration and Space Communications (ESC) Projects Division, Code 450, and the subject matter expert for Education and Public Outreach on the PAAC IV contract. She is responsible for the overall messaging for space communications at GSFC, their communications product development, and exhibiting presence.

Born

Baltimore, MD

Education

Bachelor of Arts, Communications, University of MD, College Park, MD

Life at Goddard

Amber came to Goddard in 2005 as an intern on the Hubble Space Telescope through the PAAC II contract. Her first position was working with the Hubble help desk. Because College Park was so close, she was asked to stay aboard during the school year. After 2 years with the Hubble help desk, she moved to the Hubble program office where she interned as an EPO specialist for a year. It was during that internship she was bitten by the outreach bug and learned the basics of setting up an outreach program.

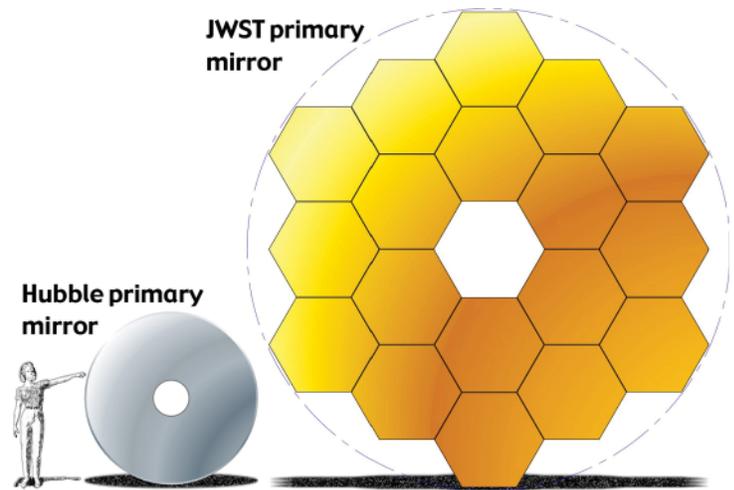
Upon graduating college in 2008, Amber migrated to the ESC Projects Division, where she has been since. After doing short tours with the Space Network and the Networks Integration Management Office, she took on the task of implementing an EPO program for space communications at GSFC. She has since grown the program to promote three spacecraft launches, new technologies, and two growing networks. She enjoys exhibiting and is regularly on the road, talking to the public about NASA's communications networks and new technology like laser communications, which Code 450 is developing as part of NASA's Journey to Mars. She has also worked with the Search and Rescue project as they

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(JWST continued from page 1)

Webb's primary mirror comprises 18 hexagonal segments, which will form a larger hexagon-like mirror attached to the backplane. Webb telescope Optical Manager Lee Feinberg said the use of a segmented mirror has been one of three main challenges with creating the observatory. On top of this, Webb must operate at temperatures far below freezing and, at the size of a tennis court, Webb has to be folded up to barely fit in the Ariane 5 rocket to launch into space and then unfold after it is free of the rocket. Webb's components must be lightweight enough for the Ariane 5 to launch, but they must also be strong to survive the harsh conditions of launch, and to remain stable at Webb's operating temperatures.

Webb requires an enormous primary mirror to look farther out into space and further back in time than Hubble. Scientists and engineers designed the telescope to view the formation of the very first stars and galaxies in the universe. Because it takes light time to travel to Earth, the farther the telescope looks, the further back in time it sees. With Webb's weight and size constraints, engineers could only achieve a large enough primary mirror to look that far using one divided into smaller segments that work together as one single large mirror. Webb's assembled primary mirror will cover a surface area of 269 square



The Webb telescope's primary mirror will be more than five times the size of Hubble's in terms of surface area.

feet, a behemoth compared to Hubble's 48-square-foot eye on the universe. The mirror's segments are made of gold-coated beryllium to save weight and reflect infrared light, and, like many of Webb's components, the mirror must fold up to fit inside its launch vehicle.

After the telescope is deployed in space, engineers on the ground will be able to move each mirror on actuators with six degrees of freedom. This means they can move the mirrors along three axes: up and down, forward and back, and left and right. Additionally, the radius of curvature can be adjusted. This reduces the risk of a problem with the mirrors, like Hubble's spherical aberration, because Webb's can correct themselves to a certain extent.

"What we need to make sure of is that we don't place the mirrors on the telescope structure in the wrong position, so that we can't move them far enough into the right position with their actuators," Feinberg said.

There's one more step before the engineers can begin installing the mirrors. If the OTE structure is Webb's spine and the mirrors are its eyes, the harnesses engineers are currently laying across the instrumentation are the veins. These harnesses, or cables, plug the mirrors in, connecting them to the electronics of the telescope.



Engineers move the mirrors in their "pods," or special shipping canisters, at Ball Aerospace & Technologies Corporation in Boulder, CO, before the mirrors arrived at GSFC.

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JWST continued from page 4)

Completing cabling is a painstaking process. “We have to be very careful when we install the cables that we’re not going to impart any strains on the backplane as the telescope cools down,” Feinberg said. “Everything has to be done according to very detailed procedures and processes. And once we’ve installed them, we have to check every wire electrically to make sure it works.”

While the harnessing design is based on that of previous spacecraft, Feinberg said project partners engaged in development testing, including testing the cables in a cryogenic environment. “Nothing is standard,” he said. “You have to get every detail right now because it has to work when we launch it in space.”

During the Hubble mission, Feinberg said he was constantly in the clean room, but he let a new generation take over on the Webb telescope. Now he primarily analyzes test data and determines next steps to get the hardware working properly. Currently, he’s looking ahead to an upcoming test at NASA’s Johnson Space Center (JSC) in Houston, during which technicians will cross-check the positions of the mirrors and actuators.

Not only will the primary mirror go through cross-checks and independent reviews before launching, so will the entire optics system. Feinberg said that the team will perform full system tests on the telescope at JSC. “We even have an independent panel that looks at all of our data and makes sure they agree when we say we think the data looks good,” Feinberg said.

Because the mirrors are held by the backplane of the telescope structure, that component is equally important to the integrity of the telescope’s images.

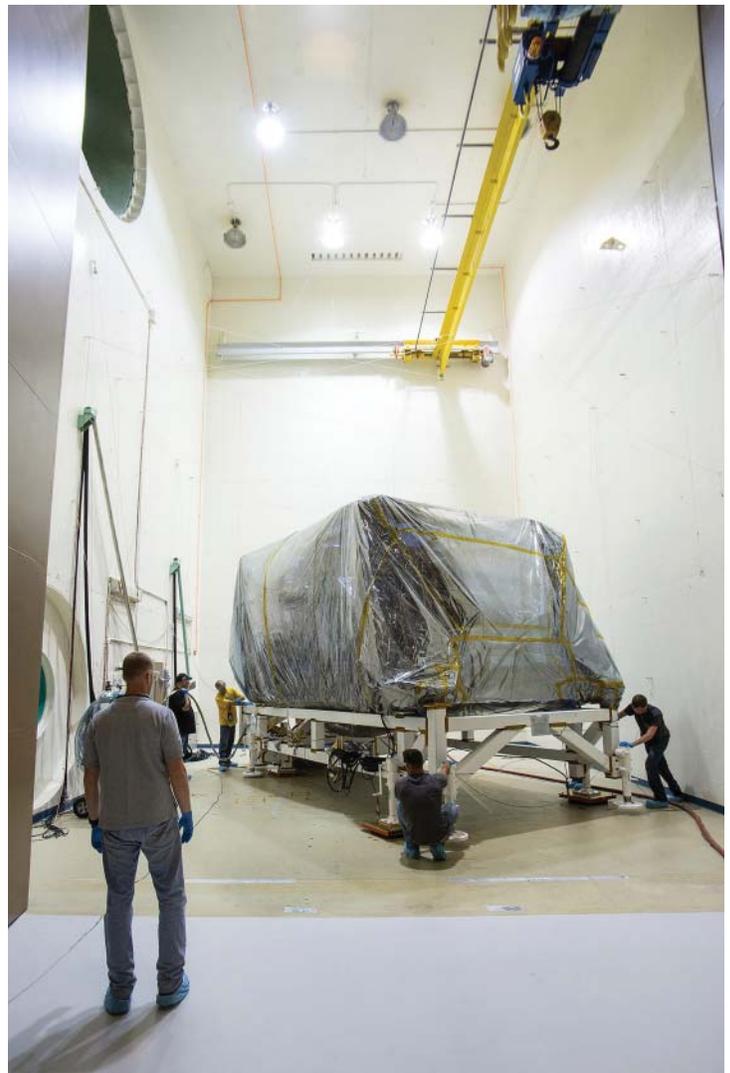
“We want to be able to focus anywhere in the field of possible places the telescope can point and have the primary mirror be stable for as much as two weeks,” Feinberg said. “Therefore the backplane, the composite structure, has to be stable just like the mirrors have to be stable.”

Engineers had to find an appropriate material for Webb’s backplane to hold the segmented mirrors steady in space. Feinberg called it one of the biggest challenges of building the backplane. It had to be stable enough to hold the mirrors, strong enough to survive launch, lightweight enough to be launched, and appropriately sized to the packaging. The team ended up with a special kind of laminate, a composite material ideally suited for the 50 kelvins, or minus 370 degrees F, operating temperature of the spacecraft.

Before the system leaves GSFC, engineers must integrate it with the Integrated Science Instrument Module

(ISIM), which will house the four main instruments on the Webb telescope that will receive the light collected and focused by the telescope and detect distant targets, like stars, galaxies, and exoplanets. Integration is expected to start in late April 2016.

ISIM has begun its third and final cryogenic test at GSFC. The several months-long test simulates the cold vacuum of space. In this environment, ISIM is exposed to the light of a simulated star to confirm that each of the instruments works accurately and can be calibrated with an actual light source. A team from NASA, the European Space Agency, and the Canadian Space Agency is monitoring the test 24/7 for its duration. Before this test could begin, several other tests needed to happen. In early August, the instrument suite passed a “severe-sound” acoustics test and a vibration test at GSFC.



The Webb telescope’s ISIM structure in the acoustic chamber for severe-sound testing.

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(JWST continued from page 5)

During the acoustics test, ISIM was exposed to five different sound levels in the GSFC acoustic test chamber to demonstrate it could survive the noise and the higher-frequency vibrations it will experience when the Webb telescope is launched. The sound experienced during launch comes primarily from the solid rocket motors of the launch vehicle. The acoustic test chamber's 6-foot-diameter speaker horns can produce a sound level as high as 150 decibels for two-minute tests. That's about the level of sound heard standing next to a jet engine during takeoff. ISIM was also subjected to vibration testing on a special table with huge electromagnetic actuators that literally shook ISIM so as to simulate the lower frequency motions it will also experience during launch.

After these tests and once engineers integrate ISIM with OTE into an assembly called OTIS—short for OTE and ISIM—the entire assembly of structures, mirrors, and scientific instruments will go through vibration and acoustic testing again before making its way to JSC for cryogenic testing.

"I was here for Hubble's first servicing mission, and that's probably the closest analogy in my career to this, where we have a bunch of critical flight hardware here at Goddard going through integration and test at the same time," Feinberg said. The first servicing mission occurred more than 20 years ago to repair a spherical aberration in Hubble's primary mirror. During that mission, astronauts installed new instrumentation to correct the aberration and replace the spacecraft's camera.

Even though this is arguably a historic moment at GSFC, Feinberg said no one on the project is thinking that way. "When I look back on Hubble, I'm like, 'Oh yeah, that was historic,'" Feinberg said. "I'm sure 15 years from now, we'll think that about this moment, but when you're in the middle of it, you're just thinking about what we're doing tomorrow."

For more information about James Webb Space Telescope, please visit:

https://www.nasa.gov/mission_pages/webb/main/index.html or
<http://www.jwst.nasa.gov/>

Ashley Morrow / Code 130
Office of Communications



Quotes to Think About

"All problems become smaller if you don't dodge them but confront them."

— **William F. Halsey**

"Our greatest fear should not be of failure, but of succeeding at things in life that don't really matter."

— **Francis Chan**

"My most brilliant achievement was my ability to be able to persuade my wife to marry me."

— **Winston Churchill**

"There's a difference between interest and commitment. When you're interested in doing something, you do it only when circumstances permit. When you're committed to something, you accept no excuses, only results."

— **Kenneth Blanchard**

"Great things are not done by impulse, but by a series of small things brought together."

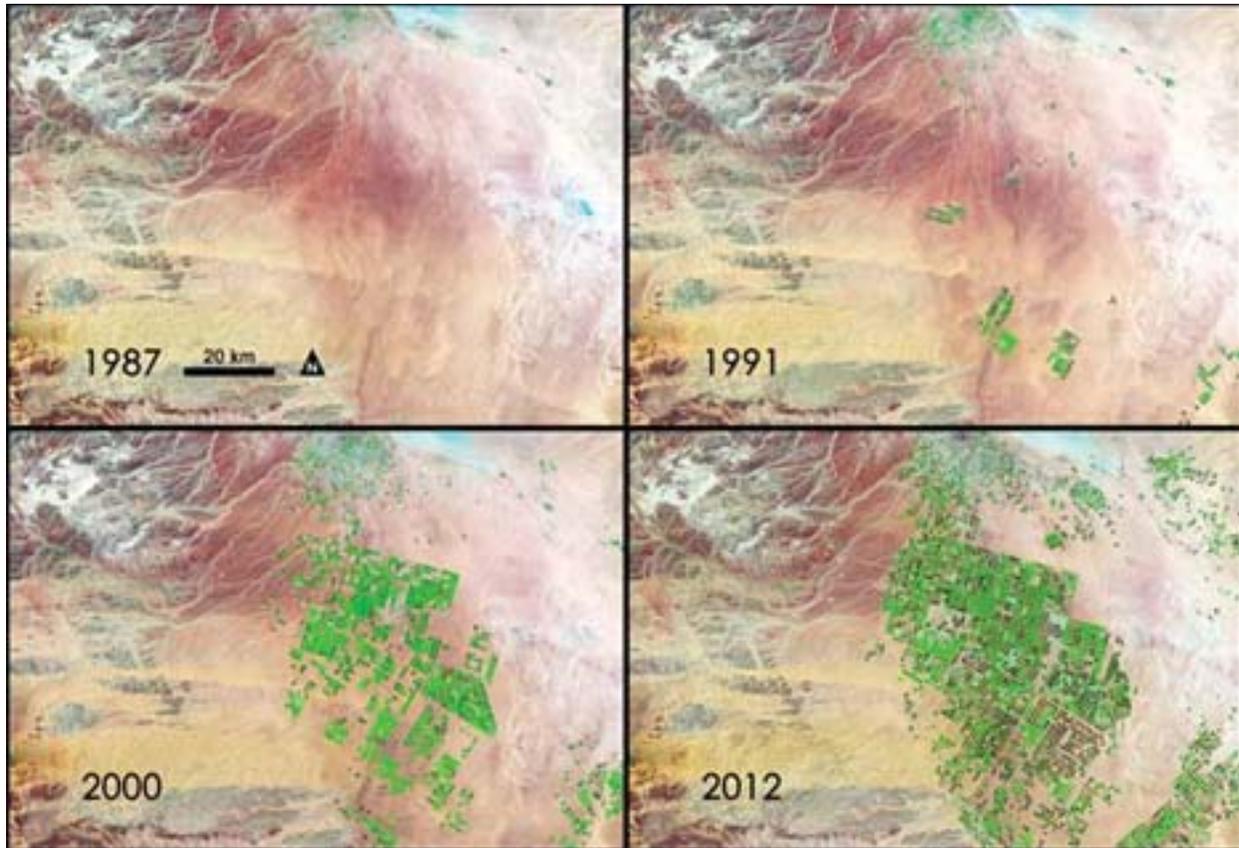
— **Vincent Van Gogh**

"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world. Science is the highest personification of the nation because that nation will remain the first which carries the furthest the works of thought and intelligence."

— **Louis Pasteur**

"It's not good enough for us to have generations of kids that... look forward to a better version of a cell phone with a video in it. They need to look forward to exploration."

— **Burt Rutan**

(Landsat 9 continued from page 1)

Landsat imagery from 1987 to 2012 shows the dramatic increase in irrigated agriculture in Saudi Arabia (green colors).

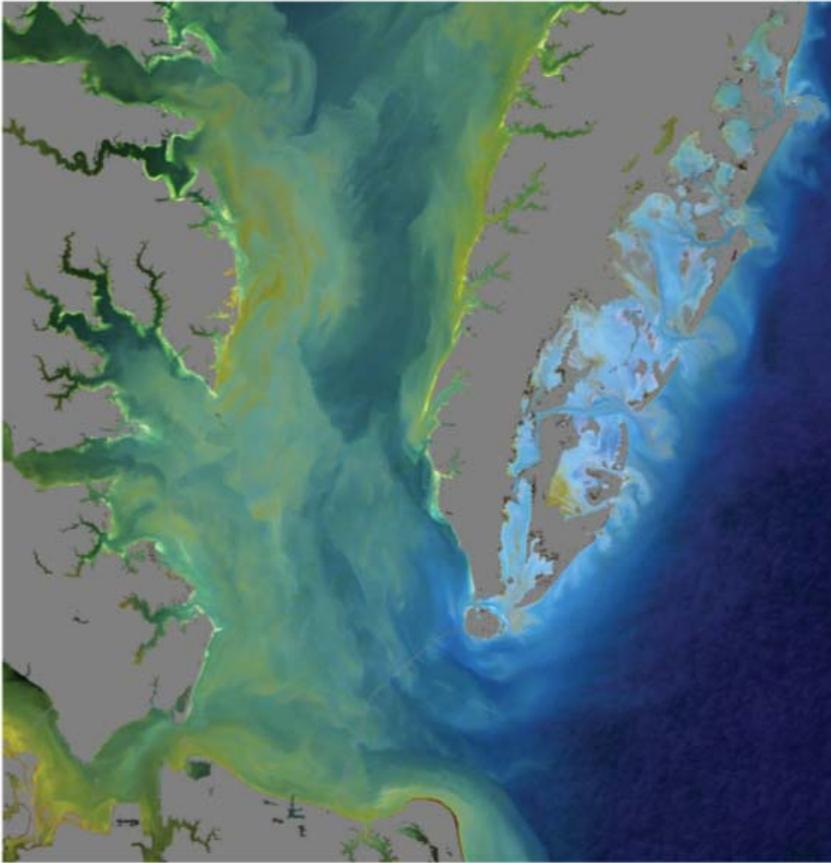
Landsat record has become invaluable for tracking changes in Earth's land cover, human land use, and the physical land environment. For example, Landsat multispectral images have provided our most accurate record of tropical deforestation and have tracked expansion of irrigated agriculture across the globe. Landsat also records the impacts of climate change and variability on the land surface, including helping to monitor the velocity of ice sheets and glaciers. A key aspect of Landsat compared to other visible and infrared imagers (such as the Moderate Resolution Imaging Spectroradiometer (MODIS) or the Visible Infrared Imaging Radiometer Suite (VIIRS)) is that Landsat collects data at relatively high resolution (30 to 100 meters), so that small-scale features, such as found through human land use, can be identified.

Like previous Landsat missions, Landsat 9 is a collaboration between NASA and the U.S. Geological Survey (USGS). NASA is responsible for the space segment, launch, and on-orbit checkout, while USGS will build the ground system, operate the satellite, and handle data processing and distribution. NASA GSFC has managed the space segment for all successful Landsat missions, including the current Landsat 7 and Landsat 8 satellites, launched in 1999 and 2013, respectively. Although the

science goals of the Landsat program have remained consistent, the imaging technology has naturally evolved over time. The Landsat 8 system now acquires data in 11 spectral channels across the visible and infrared spectrum, including Earth-emitted (thermal) radiation in the 10 to 12 micron region to measure surface temperature.

To constrain cost and minimize risk, Landsat 9 will be implemented as a full Class B rebuild of Landsat 8 and will fly the same two instruments as Landsat 8: the Operational Land Imager-2 (OLI-2) and the Thermal Infrared Sensor-2 (TIRS-2). The OLI-2 imager will be an exact copy of the Landsat 8 OLI, and will provide 30-meter resolution imagery in the reflective (visible through shortwave infrared) bands via a "pushbroom" linear array. The performance of the Landsat 8 OLI has been outstanding to date, and the improved radiometric quality of the data has opened new applications areas such as mapping lake and coastal water quality. NASA has announced the intent to sole-source the OLI-2 instrument to Ball Aerospace & Technologies Corporation, the builder of the original OLI. Rebuilding the OLI instrument allows reuse of a successful design, as well as flight-quality spare components from Landsat 8, thus saving cost and schedule.

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(Landsat 9 continued from page 7)

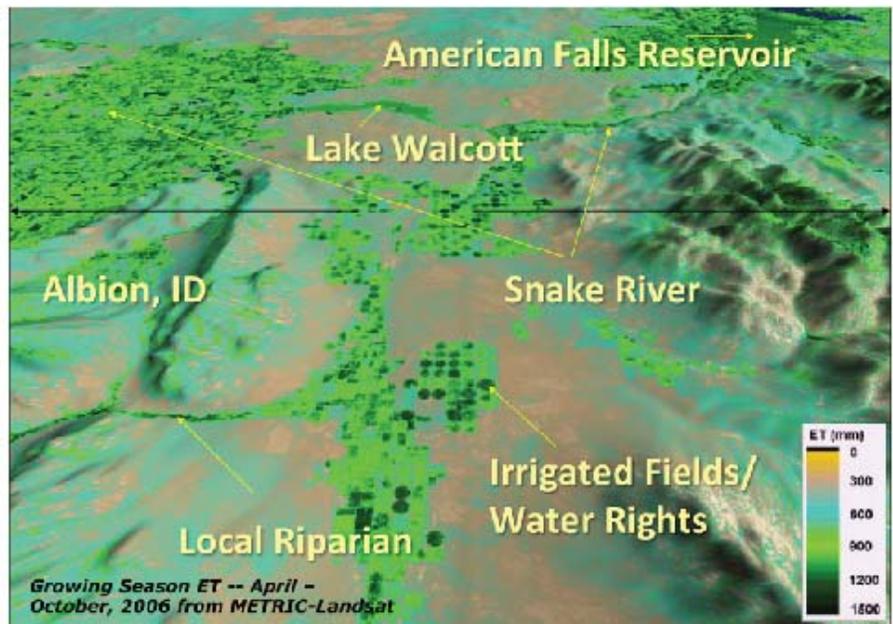
The improved radiometric quality of Landsat 8's OLI allows better determination of water quality compared to past Landsat sensors. In this multi-spectral image of the Chesapeake Bay, shades of blue and green correspond to varying levels of chlorophyll and suspended sediment. (courtesy Bryan Franz, GSFC)

Thermal imagery will be provided via the GSFC TIRS-2 instrument, which will be an upgrade to the Landsat 8 TIRS instrument. TIRS-2 is also a pushbroom instrument relying on Quantum Well Infrared Photodetectors (QWIPs) to provide sensitivity in the 10 to 12 micron region with a high degree of radiometric stability. The original TIRS was built on a compressed schedule and was designed to a nominal 3-year design life (Risk Class C). TIRS-2 will add selective redundancy to boost reliability to meet Landsat 9 requirements of flying all Class B instruments and 5-year design life. In addition, TIRS-2 will mitigate stray light effects that have affected the radiometric accuracy of the Landsat 8 TIRS.

Landsat 9 will be launched into a polar, sun-synchronous orbit, where it will acquire at least 400 land images per day. These data will be geometrically and radiometrically corrected at the USGS Earth Resources Observation and Science (EROS) center and then distributed to users—all within 24 hours of acquisition. An important aspect of Landsat data products is that they are carefully calibrated to physical units (e.g., at-sensor), using both onboard calibration devices and vicarious (lunar and Earth target) approaches. This enables the use of Landsat data for scientific applications, such as long-term monitoring of surface temperature or albedo, not possible when using un-calibrated sensors. Since 2008, all Landsat data have been available at no charge from USGS, which has dramatically spurred both commercial, governmental, and international usage of the data.

Beginning in 2023, data products from Landsat 9 will provide continuity with the (by then) 50-year Landsat record and will support research and operational land management activities across the globe. Landsat remains the most widely used land remote sensing system in the world and a singular contribution of GSFC to the quality of life on Earth.

*Del Jenstrom / Code 429
Landsat 9 Project Manager*



The amount of evapotranspiration, a key input for monitoring water use, can be calculated via Landsat thermal data and energy balance models. This example is for the 2006 growing season in Southern Idaho. (courtesy Richard Allen, U. of Idaho)

What's Up with the Flight Projects Development Program?



FPDP participants (left to right): Lateef Ajayi, Nylsevalis Ortiz Collazo, Beth Weinstein, Don Whiteman

The Flight Projects Development Program (FPDP) is a Code 400 initiative designed to develop highly competent project management personnel, for both technical and business tracks. The FPDP is a 2-year, rigorous and structured program, intended to accelerate learning and growth in flight project management through the completion of concentrated coursework, relevant work assignments, varied developmental opportunities, comprehensive mentoring, and a Capstone Project.

The first Cohort, known as Cohort #1, officially commenced in April of 2014. During year one, the participants were assigned to their first of two year-long work assignments, chosen by the FPDP Governance Board, currently chaired by Dave Mitchell, Director of Flight Projects. The work assignments are

foundational to the program and fill identified gaps, enhance the participant's understanding of flight project management, and provide hands-on, real-world experiences. During year one, in addition to the work assignments, the participants attended project management-related workshops and other developmental activities, received extensive formal training through APPEL and other training venues, and met regularly with mentors for one-on-one learning and sharing.

Cohort #1 participants began their second year of the program in the spring of 2015. The participants are fully engaged in their work assignments and are currently serving in the following positions:

Lateef Ajayi – TIRS-2 Financial Manager

(Continued on page 10)

(FPDP continued from page 9)

Nylsevalis Ortiz Collazo – GOES-R Program Financial Manager

Beth Weinstein – PACE Observatory Manager

Don Whiteman – ATLAS Deputy Instrument Project Manager

The participants continue to attend project management developmental activities, receive formal classroom training, meet with their mentors, and additionally, they are busy developing a Capstone project where they are collaborating to develop and recommend solutions to a Center/Code 400 problem. They will present their Capstone product and recommendations to the FPDP Governance Board next April. Cohort #1 is on target for a spring 2016 graduation.

Cohort #1 is also helping the directorate prepare for FPDP Cohort #2. Cohort #1 has provided valuable feedback through two Pause and Learns and other vehicles, allowing us to refine the FPDP requirements and processes. They also participated in an FPDP Lunch and Learn panel discussion where they responded to questions raised by GSFC civil servants interested in applying for Cohort #2. The FPDP Cohort #2 opportunity was announced through USAJobs September 30 through October 30. For more information about the FPDP, please refer to the charts at the following link:

[FPDP Cohort #2 presentation](#)

or feel free to contact Cecilia Allen Czarnecki, at Cecilia.A.Czarnecki@nasa.gov or 6-7398.

Cecilia Allen Czarnecki / Code 400
Assistant Director

(McCarthy continued from page 3)

time for Tom, but a trying time for his family (wife and three children in middle school), due to his commute from Philadelphia to Hunt Valley each week for the first 2 years of his GM tenure. At the conclusion of the second sale of the company in 2001, Tom left the new parent company for an opportunity to join NASA GSFC.

Life At Goddard

Tom came to GSFC in 2001 as the Chief Technology Engineer for the Thermal Engineering Branch. He served as the Applied Engineering & Technology Directorate Chief

Engineer from 2005 thru 2007; as the Division Chief for the Mission Engineering and Systems Analysis Division from 2007 to 2010; as the Deputy Associate Director for Earth Science Projects from 2010 to 2013; and as the Associate Director for Earth Science Projects at GSFC, as well as the Program Manager for both the Earth Systematic Missions Program and the Reimbursable Projects Program at NASA Headquarters from 2013 to 2015.

Life Outside Goddard

Tom is married with three children, enjoys traveling with his wife, planning three weddings, riding his Harley, and horse racing.

(Jacobson continued from page 3)

debuted their two newest antennas on top of Building 28 this year and performed three airplane drop tests at NASA Langley. Her favorite moments are when she sees her project being mentioned or referenced on a national level, such as the CBS Evening News (for good reasons), Jay Leno, and NCIS.

Life Outside Goddard

Amber and her husband Scott reside in Mount Airy, just east of Frederick. They own a 115-year-old farmhouse on nearly four acres of land. Maintaining and updating the house keeps them busy most weekends. In their free time, they enjoy spending time with their friends and family. Scott and Amber are also big Ravens fans and spend Sunday afternoons cheering them on.



Amber with Charlie Bolden, NASA Administrator, and Steve Jurczyk, Associate Administrator for the Space Technology Mission Directorate.

Raising Phoebe

(Part 2)

I want to personally thank the GSFC community, especially the Joint Polar Satellite System (JPSS) program office, for opening your doors to Phoebe, my guide dog in-training during this past year. This was a new experience for me, and I am proud of how Phoebe grew and matured during that time.

Guiding Eyes for the Blind (GEB) breeds, raises, and trains dogs with the goal of placing them with individuals who need help due to visual impairment. Guide dogs provide vision, guidance, and decision-making skills to assist individuals by opening up new horizons and enabling them to function in ways not otherwise possible. GEB depends on volunteer “puppy raisers” to teach the puppies foundation skills, house manners, behavior expectations, and socialization skills.

Phoebe was placed with me as her “puppy raiser” in May 2014, and she has come a long way since then. Phoebe accompanied me almost everywhere I went, providing opportunities to improve her socialization skills and her ability to perform tasks in varied situations and places. Phoebe spent many days at GSFC, with her last day being September 10, 2015. She received a terrific send-off from

the JPSS team and got the chance to make a final visit to her many friends throughout GSFC.

On September 11, I said goodbye to Phoebe as she travelled to the GEB training center in Yorktown Heights, NY. Phoebe’s entrance test took place on September 15, 2015. During the test, Phoebe looked great in the beginning but began to have difficulties with certain steps (e.g., disliked wearing a harness), where she lost her poise and focus in completing the test. Phoebe made clear that she doesn’t want to do some of the tasks required of a working guide dog. This was a surprise and a disappointment but Phoebe was never one to hold back to let you know what she wants.



Ed and Phoebe at the beach

However, there’s a happy ending to the story. Phoebe was released from the GEB guide dog program and I as her puppy raiser was given first opportunity to adopt her. I jumped at the chance and Phoebe’s now back home with me as a life-long pet. She’s a great dog, she’s beautiful, and we’re both happy she’s back.

To learn more about Guiding Eyes for the Blind, or to contribute, please visit: <https://www.guidingeyes.org/>. [Combined Federal Campaign \(CFC\) National Capital Area Code 10248](#)

*Ed Ruitberg / Code 470
JPSS Program Planning Analyst*



Phoebe ‘selfie’

Explore @ NASAGoddard



On Saturday September 26, GSFC welcomed more than 20,000 people to the Center to tour facilities, learn about NASA science, technology and missions, and participate in fun activities. Code 400 personnel assisted in many ways – staffing activity booths, giving tours, and sharing information about their work.



Onlookers watch a launch at the Visitor Center.



Matt Ritsko, the TESS Deputy Project Manager for Resources, answers questions from the public about the TESS instrument.



Gifford Moak (retired Code 400 Deputy Project Manager for Resources) demonstrates how TESS will find new exoplanets. The TESS project provided a motorized model of a solar system and detector that showed dips in the brightness of a light, indicating transits of various types of exoplanets.



The Building 29 clean room viewing area received many visitors eager to see the latest developments in the James Webb Space Telescope assembly.



Marion Riley, Lockheed Martin HST Observatory Development Manager, helps a visitor with the Mini Power Tool, used during HST Servicing Mission 4.



Kevin Carmack, LCRD Project Manager, explains the basics of laser communications to young attendees.



LCRD configuration management officer, Jonathan Weiland, educates guests on different wavelengths using a water table.



Thumbs up from two visitors to Building 29.



Celebrate HACE!

On September 18, 2015, the Center's Hispanic Advisory Committee for Employees (HACE) sponsored its annual Hispanic Heritage Month luncheon. While this must-attend event sells

out every year, this year's event was particularly memorable for Code 400! This year, Code 400's Diversity and Inclusion Committee co-sponsored the event and Ms. Sandra Cauffman, Deputy Systems Program Director for the Geostationary Operational Environmental Satellite (GOES)-R Series, was the keynote speaker.

Carlos Duran-Aviles, vice-chair of HACE, kicked off the event by explaining why we observe National Hispanic Heritage Month from September 15 to October 15. September 15 marks the anniversary of independence for Latin American countries such as Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. Mexico and Chile celebrate their independence days on September 16 and September 18, respectively. Also, Columbus Day or Día de la Raza, which is October 12, falls within this 30-day period. We celebrate the histories, cultures, and contributions of American citizens whose ancestors came from Spain, Mexico, the Caribbean, and Central and South America.

We each come from a different place. A different background. A different country. A unique story. Coming together as ONE to represent the interests of the Goddard's Hispanic Community and share the importance of diversity and inclusion. We are HACE!

Center Director Chris Scolese, our first speaker, described this month as a wonderful time where we come together to celebrate our Hispanic community and their richness in culture. HACE's Senior Champion, Steve Shinn, Code 400 Deputy Director for Planning and Business Management, thanked Chris Scolese for joining in on the celebration. Steve discussed HACE and their importance to the Center and to diversity and inclusion. He described the committee members as being incredibly engaged and tire-

less workers who promote diversity and inclusion for both their constituents and GSFC. He paraphrased HACE member Julie Rivera Perez's description of the group:

We each come from a different place. A different background. A different country. A unique story. Coming together as ONE to represent the interests of the Goddard's Hispanic Community and share the importance of diversity and inclusion. We are HACE!

Steve then introduced Goddard's first female Hispanic Heritage Month luncheon speaker, Ms. Sandra Cauffman. Sandra serves as the Deputy Systems Program Director for the GOES-R Series program, a multi-billion dollar operational geostationary weather satellite program developed in partnership with the National Oceanic and Atmospheric Administration. Born in Costa Rica and fluent in Spanish, Sandra frequently visits schools nationally and travels to developing countries to share her special story. As keynote speaker, she spoke about her journey from Costa Rica to NASA.

Sandra shared her personal experiences from her earliest years. Her mother, the sole income earner for the household, held multiple jobs to support the family. Sandra, seeing the need to help her mother, started to work while still in high school. She excelled in all subjects in school, especially in mathematics and science. She dreamed of going to college and becoming an electrical engineer. At the time, the University of Costa Rica discouraged women from studying male-oriented degrees. Her mother was a wonderful inspiration and said that if she worked hard, anything was possible. When she enrolled at the University of Costa Rica, she asked to study electrical engineering, but was steered instead into industrial engineering because there were a few women in the program already. Sandra did well but was left unfulfilled. At that time, her mother met an American man who had recently retired to Costa Rica where housing and the cost of living were much less expensive than in his home country. Sandra was in the middle of her studies at the university when her mother decided to marry her step-father. After hearing multiple times of how unhappy Sandra was with her studies and wanting to pursue something more challenging, he offered to move the family to the U.S. so that she could study electrical engineering.

At the time Sandra moved to the U.S., she did not speak any English. Through determination, hard work, and dedication, she pushed through language challenges, enrolled in school, and attended classes which was very difficult. Sandra excelled, completing her Bachelor of Science in Physics, a Bachelor of Science in Electrical Engineering, and later she went back to school to

(Continued on page 15)

(HACE continued from page 14)

complete a Master of Science in Electrical Engineering.

Sandra shared many inspiring messages throughout her speech, but she closed with a challenge:

“I challenge you:

First, take responsibility for your own life. If you don't, someone else will and their choices may not be good for you.

Second, identify a dream that pulls you out of your comfort zone. Feel the fear and do it anyway.

Third, stay the course. Be committed and persevere through all of the obstacles in your path.”

As Sandra concluded, she was met with a standing ovation from the crowd! The audience was inspired and moved by her story of dedication and perseverance. The HACE leadership team presented Sandra with a plaque commemorating the event.



HACE leadership team presents keynote speaker Sandra Cauffman with a plaque. (left to right): Carlos Duran-Aviles, Steve Shinn, Sandra Cauffman, Julie Rivera Perez, Javier Ocasio-Perez, and Miguel Polanco.



Entertainment from the Arte Flamenco Group

The event concluded with a performance from the Arte Flamenco Group. Flamenco is the music from the south of Spain, the sunny province of Andalucia. Food was provided by Cuba de Ayer. The menu included ropa vieja (a traditional Cuban shredded stewed beef), rice and beans, yucca, and sweet fried plantains. Each year the desserts are not to be missed and this year was no

exception. The table included many traditional Hispanic treats including flan (caramel custard), flan de queso (caramel cream cheese custard), pastelillos de guayaba (guava pastries), and tres-leches (sponge cake soaked in three milks). We hope you will join us next year at the Hispanic Heritage Month luncheon!

***Steve Shinn / Code 400
Deputy Director for Planning &
Business Management***

***Linda Wunderlick / Code 400
Program Planning & Support Analyst***

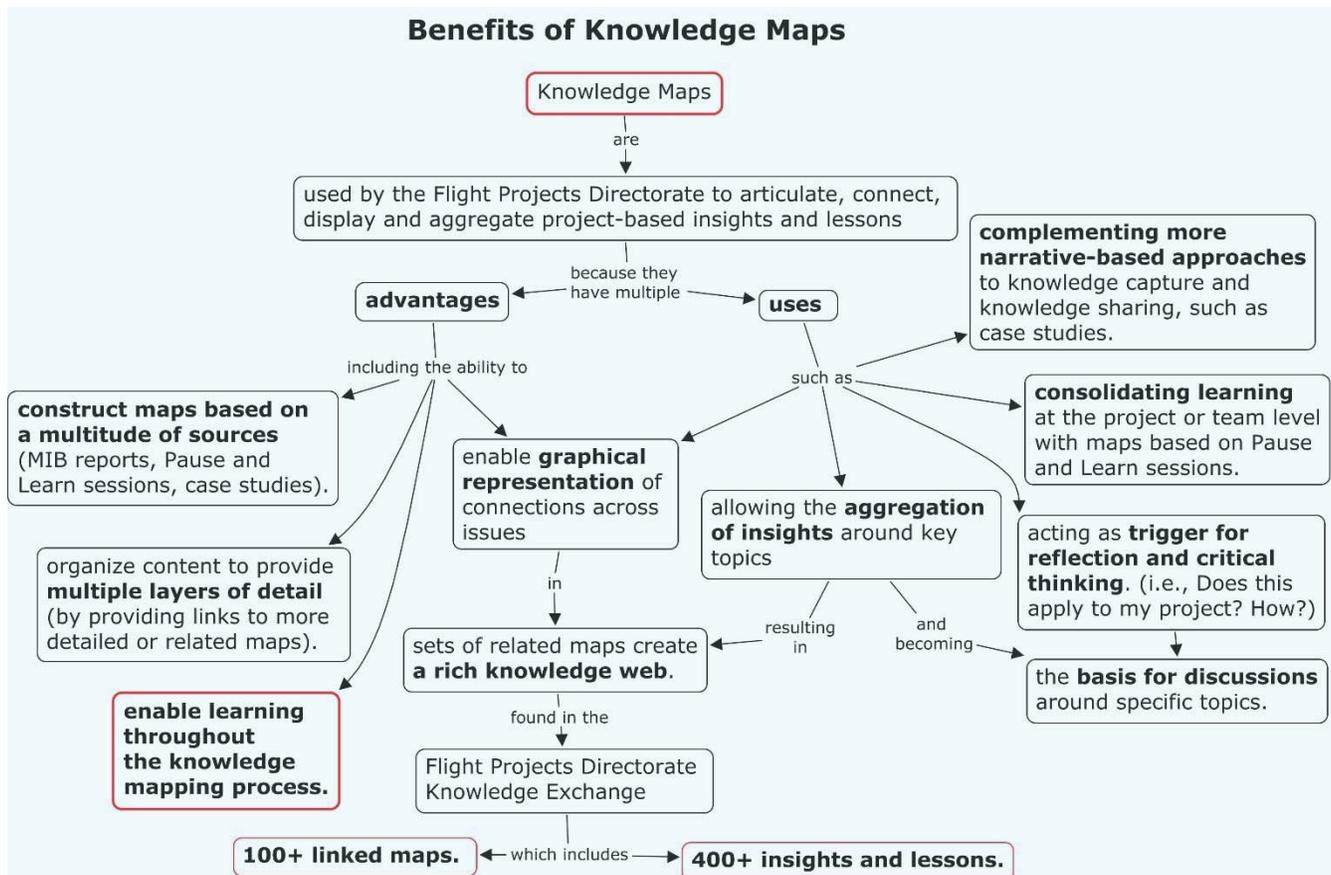


Traditional Hispanic desserts

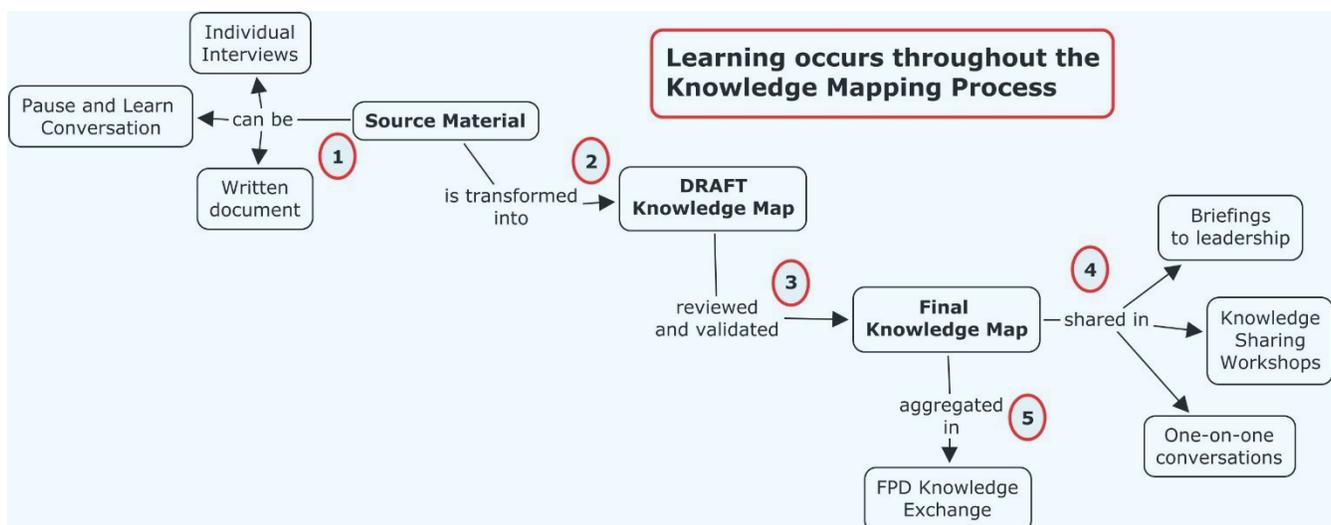
Knowledge Management Corner

Program/Project Learning with Knowledge Maps

Sometimes a map can more efficiently convey key information than a few paragraphs of text. See if the map gives you a sufficient understanding of the benefits of knowledge maps.



Any existing text can be transformed into a map, even a conversation. A set of interviews can be synthesized into a single map. In every case, learning occurs throughout the knowledge mapping process.



(Continued on page 17)

(Knowledge Maps continued from page 16)

The small concept map at the bottom of page 16 is very high level and lacking in details. A few paragraphs of text can help provide more context to interpret the main message. Paragraph numbers below correspond to the number on the map.

(1) Learning in conversation: When the source material for a map is a conversation such as a Pause and Learn session, a great deal of learning happens in the conversation itself. Active listening and engagement in a purposeful conversation is a powerful form of shared learning.

When the source material for a map is a written document, a significant amount of learning also occurred in the process of writing the document, because writing forces clarifying one's thoughts and synthesizing.

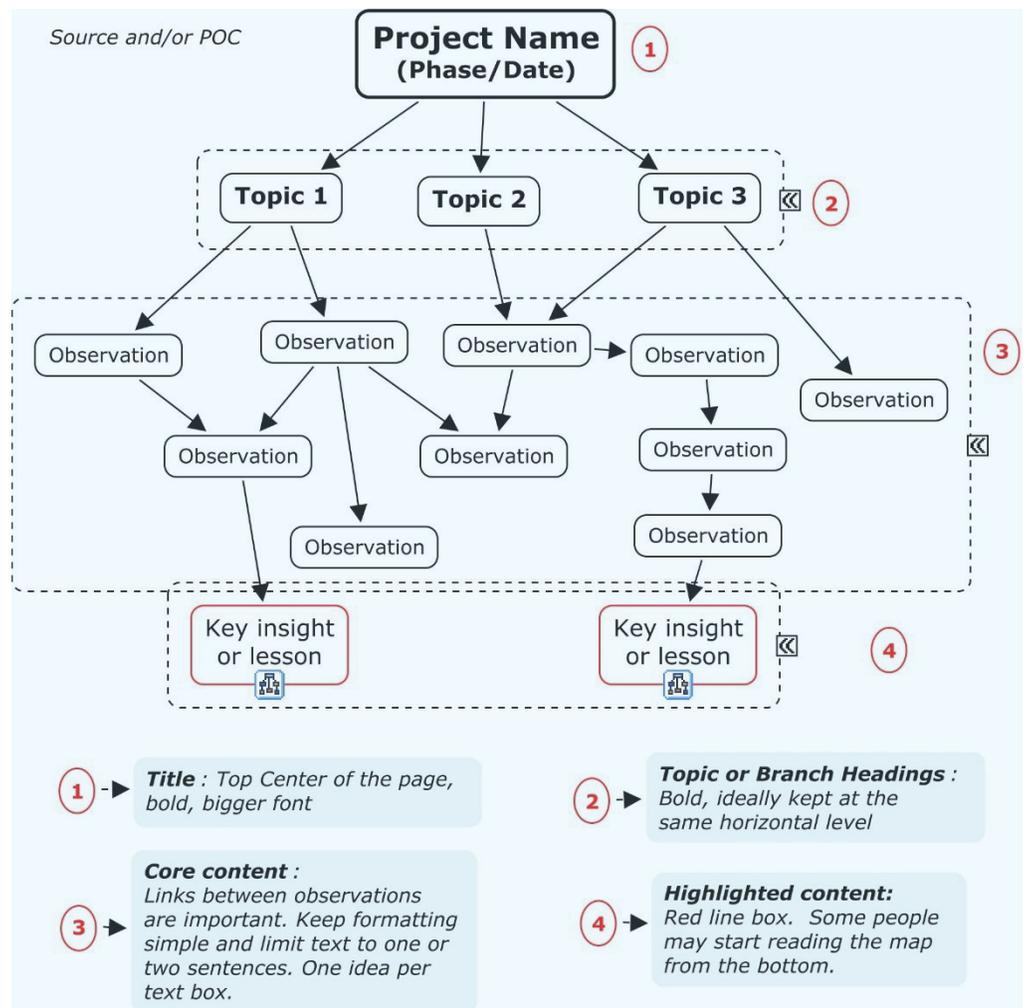
(2) Learning by mapping: Developing the map involves selecting the key concepts and ideas that were brought up and deciding how they best fit together. It also requires connecting the dots. While collaborative mapping is an option, in most cases, maps are drafted by one individual and the learning benefits of mapping are therefore limited to that individual. On the other hand, for the sake of efficiency, it may be best to have a single mapper just like it is often more efficient to have one person draft a document and multiple reviewers and editors to finalize it.

(3) Learning through validation: Participants in the source conversation, and sometimes other stakeholders, need to review and validate the map(s) to ensure that the representation is accurate. This review and validation demands further reflection. In particular, at that point in the process, it is important to make sure that if the maps are going to be available for others to see, they are understandable by others. It is one thing to keep a brief record of a conversation as trigger for one's own memory. It is more complex to keep a

record of a conversation so that others will be provided with enough details and context to make sense of the conversation as a whole, without having to read a full transcript of what was said.

(4) Learning in conversation (with the map): Once the maps are finalized, they can be used to help convey key insights or lessons to others, in the context of one-on-one conversations with top management, or panel discussions with a wide range of employees. Maps can also be "discovered" by project team members as they seek lessons from other projects and bring them up to the attention to their peers and team members.

(5) Learning through aggregation: Over time, as more and more maps and insights are aggregated, a critical mass of knowledge emerges enabling a careful review of trends or issues occurring across projects. The maps can become a source of powerful warnings to new projects and facilitate the identification of challenges in need of institutional attention.



(Continued on page 18)

(Knowledge Maps continued from page 17)

Different mapping tools offer different display options, including many bells and whistles that can distract from the purpose of the map. Key elements that have proven useful are basic text boxes with normal text formatting options, color, connecting lines, and hyperlinks.

Mapping allows the discovery and documentation of linkages across concepts, ideas, insights, but also across documents. Since maps can become very large and complex, and difficult to digest as a single document, they can be segmented into more manageable topic maps without losing too much of the inter-linkages. Hyperlinks are particularly helpful for connecting multiple maps or linking to other resources. In the template map on page 17, the small icons attached to key insights denote hyperlinks.

All of the key insights identified on a map should not automatically be turned into formal lessons. However, once the mapping is done, it is much easier to identify key lessons and write the corresponding formal lesson learned if submitting a formal lesson is the appropriate path (see the previous article, “Guidelines for Documenting Project Lessons Learned – Part Two: Writing High Quality Lessons Learned” in The Critical Path, Fall 2014). When a system

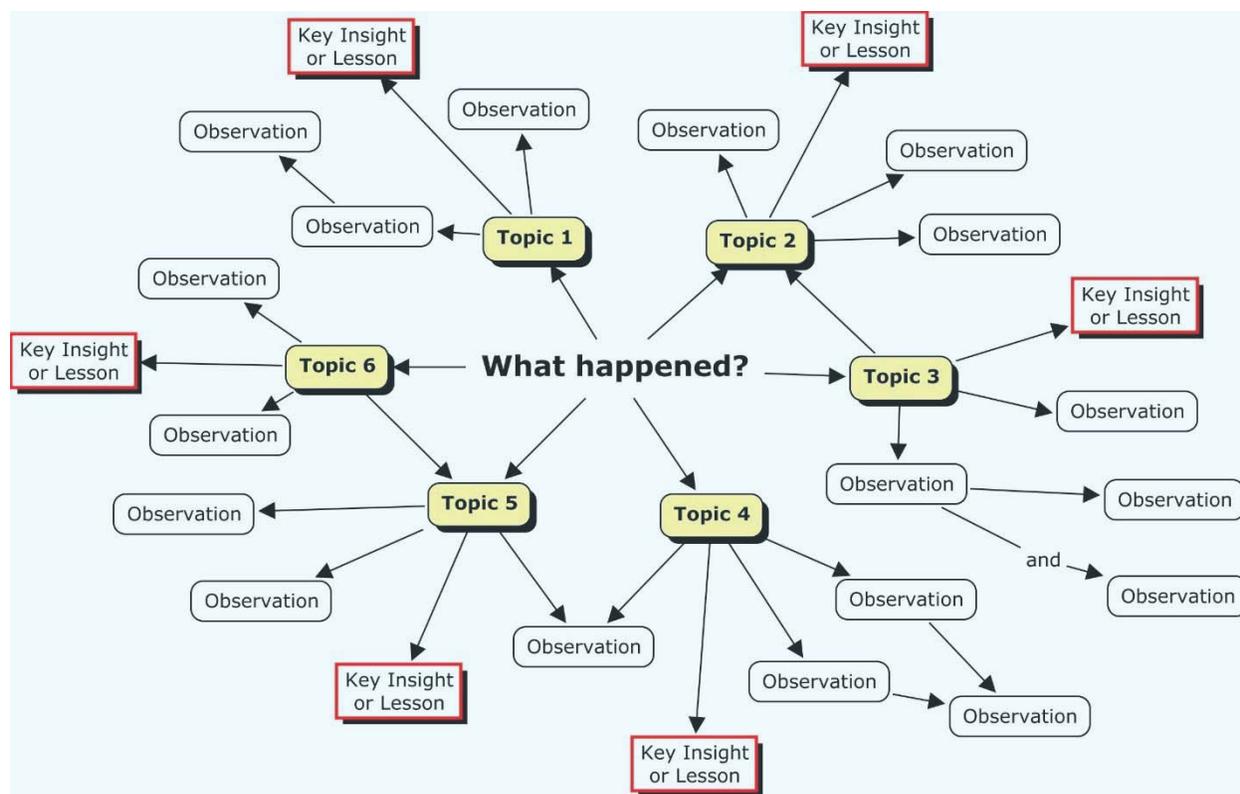
of maps is being developed, it helps to have a consistent approach to displaying the maps. For example, the model above is used for Knowledge Maps (KMAPs) in the Flight Project Directorate Knowledge Exchange.

Another format, favored by Goddard’s Chief Knowledge Officer, Ed Rogers, which is closer to a traditional concept map or mind map, involves putting a key question at the center of the map (see template map below). For briefing purposes, a PowerPoint can accompany the map, with each key insight on a separate slide and a few bullet points for background or support. A single map has the advantage of providing a big picture on one piece of paper and showing all the connections.

Do you want to try your hand at knowledge mapping?

Contact Barbara Phillip @ barbara.fillip@nasa.gov.

Barbara Phillip, Code 400
Knowledge Management Project Manager



Social News

- Alissa Brook Wigdor, daughter of Marc Wigdor (Code 472), was married to Ryan Griffin on September 26, 2015. For those Harry Potter fans, they are now Griffindor House.
- Congratulations to Josie Soper (Code 490.2) on becoming a first-time grandmother. Vivien Soper was born on September 19, 2015, weighing in at 9 lbs., and 21 inches long. Mom, Dad, and baby Vivien are all doing very well and learning how to work with each other's schedule. Josie could not be more happy!
- Best wishes to Pamela Wood (Code 460), daughter of Paula Wood (Code 460) who was married to Christopher Merkel on October 3, 2015. Pamela is a Resource Analyst supporting TESS, and Christopher is a Maryland State Trooper.
- Congratulations to Lauren (Code 428) and Brian (Code 408) Tokarcik on the birth of their first child, Owen Lawrence Tokarcik. Owen was born on November 28, 2015, weighing 8 lbs. and measuring 20 inches long. Grandmother Maureen Disharoon (Code 443) is also thrilled!



Pamela and Christopher Merkel



Owen Lawrence Tokarcik

Cultural Tidbit

Did you know...on January 1, 1892, Ellis Island's Immigration Station was opened in New York City's harbor. Millions of new immigrants passed through Ellis Island between then, and when it closed in 1954. It is estimated that roughly 40 percent of U.S. citizens can trace at least one of their ancestors to Ellis Island. In 1924, the National Origins Act restricted immigration and greatly reduced the number of people who entered the United States through Ellis Island. You can search passenger records at <http://libertyellisfoundation.org/passenger>.

Do you have a cultural tidbit to share? Send it to Code 400 Diversity and Inclusion Committee, c/o Matthew Ritsko at: matthew.w.ritsko@nasa.gov and we'll include it in a future issue of The Critical Path.

Code 400 Peer Award Winners for 2015

Boundless Energy

Maureen Disharoon

In recognition of your dedication to the Flight Projects Directorate and the Program Analysis and Control contract, and your extraordinary effort in juggling multiple tasks.

Sarah Dureja

In recognition of your exceptional service to the Instrument Projects Division, and ability to continually exceed all performance expectations.

Carol Grunsfeld

In recognition of your tireless effort and boundless energy managing DSCOVN business and going above and beyond to make the DSCOVN launch a success.

Diversity

Celina Hanewich

In recognition of the positive difference you make every day in modeling inclusive behaviors and volunteering for worthy causes to enhance the work environment for the Flight Projects Directorate.

Mentor

Shama Khan

In recognition of your patience, encouragement, and empathy along with your extra time and energy in support of mission success.

Heidi Wood

In recognition of your outstanding leadership and ability to build strong teams through your skills as a mentor.

Mission Impossible

Mark Belz

In recognition of your ability to execute tasks with efficiency, deliver quality work, and do whatever is necessary to get the job done.

Justin Cassidy

In recognition for your big ideas for seemingly impossible missions.

Chuck Clark

In recognition of your creative and dedicated efforts and long hours to successfully get through the NIRCAM hardware issues during the post ISIM CV2 rework activities.

Chris Derkacz

In recognition of your outstanding scheduling support to the TESS project and the Flight Projects Directorate.

Chris Greco

In recognition for doing more with less and your outstanding support to the MMS Project. You helped keep MMS moving forward during a critical time. Your hard work has not gone unnoticed.

Mark Melton

In recognition of your support in developing and managing the 2015 WFIRST SDT Study Report.

Jennifer Poston

In recognition for your creative, resourceful, and innovative business solutions development for the Flight Projects Directorate's information and communication frameworks.

Hannah Scherer

In recognition for your ability to tackle impossible assignments to streamline the spacecraft verification process for the James Webb Space Telescope project system engineering team.

Robert Schweiss

In recognition for the outstanding job successfully developing and delivering the DSCOVN MOC to the NOAA Satellite Operations Facility with limited funding, a small team, and a short schedule.

Chris Tinker

In recognition for supporting 11 in-house instrument projects with all of their IT security requirements as single POC for the Code 490 division.

Dr. Thomas Varghese

In recognition for your outstanding technical leadership and achievement in sustainment of NASA's Satellite Laser Ranging (SLR) Ground Network.

Adam Wilson

In recognition for taking on more responsibility while keeping your main responsibilities running strong.

(Continued on page 21)

*(Peer Awards continued from page 20)***Rookie of the Year****Joan Bennett**

In recognition for your agility, dedication, and exemplary financial management support for the Astrophysics Projects Division.

Katie Bisci

In recognition of extraordinary business support for the WFIRST project.

Deborah Cusick

In recognition for overcoming the challenges associated with leading the move of the DSCOVER project to and from the launch site, without having previously participated in a launch campaign.

Karen Rogers

In recognition of your professionalism and accomplishments as Deputy Administrative Officer for the Flight Projects Directorate during your first year in the position.

Steady Helm**Tim Bensch**

In recognition for your outstanding efforts driving the SGSS Joint Confidence Level to completion on a very aggressive schedule.

Robert Cogar

In recognition and appreciation for maintaining a “Steady Helm” in the Joint Polar Satellite System (JPSS) Ground Project Configuration Management (CM) Office.

Michael Honaker

In recognition and appreciation of your outstanding engineering support for the POES project.

Jean Huber

In recognition of your work ethic, attention to detail, and your calm and steady demeanor, while fostering creativity and effectiveness for the JWST spacecraft verification team.

Jim Rogers

In recognition of your exemplary efforts and subject matter expertise in planning and scheduling for the Flight Projects Directorate.

Jeff Volosin

In recognition for your continued superior leadership of the TESS project team.

Linda Wunderlick

In recognition for doing the impossible for everyone in the directorate.

The Silo Slammer**Keith Walyus**

In recognition for your exemplary efforts in eliminating stovepipe project configuration management systems within the Flight Projects Directorate.

Unsung Hero**Dena Butler**

In recognition of your leadership and participation in the PAAC IV SEB, and the generosity you brought to the team as evident by your willingness to perform any task.

Darlene Fennell

In recognition for going above and beyond to support the SLI program, Landsat 9, and the multiple Thermal-Infrared Free Flyer PPBE17 packages.

Warren Thompson

In recognition of your outstanding support of the MMS I&T effort and the development of the I&T network.

Wild Card**Tracy Felton**

In recognition of your professionalism, outstanding leadership, work ethic, energy, devotion to detail, and quality of work to GSFC, Code 400, and the ESC Division.

Val Lunz

In recognition of your extraordinary efforts in driving adoption of many best practices across Flight Projects Directorate (FPD) and restructuring FPD's internal and external web sites.

Jeffrey Smallowitz

In recognition of your dedication and leadership in developing, planning, and executing the structural testing of the James Webb Space Telescope spacecraft.

Comings and Goings

July 1, 2015 through September 30, 2015

Comings:

- ❖ Robert M. Connerton (from 550) to 407/Earth Science Technology Office, Technology Development Manager
- ❖ Joana L. Lauderdale (from 152) to 429/Landsat 9, Financial Manager
- ❖ Felipe P. Romo (from 210S) to 423/ESDIS project, Senior Resources
- ❖ Kelly K. Hyde (from 580) to 444/SSMO project, Project Support Specialist
- ❖ Arindam “Neil” Mallik (external hire) to 450.1/Networks Integration Management Office, Human Space Flight Assistant Network Director
- ❖ Daryl M. Hutchinson (from 501) to 428/ESMO project, Senior Resources Analyst
- ❖ Azita Valinia (from 600) to 407/Earth Science Technology Office, Technology Program Manager
- ❖ Joan E. Bennett (external hire) to 441/HST Operations Project, Resources Analyst
- ❖ Jason M. Baldessari (external hire) to 444/Space Science Mission Operations project, Resources Analyst
- ❖ Joseph B. Hickman (external hire) to 490/Instrument Projects Division supporting ATLAS, Resources Analyst
- ❖ Christopher M. Grau (external hire) to 443/James Webb Space Telescope (JWST) project, Resources Analyst
- ❖ Patricia A. Miller (external hire) to 490/Instrument Projects Division, Resources Analyst
- ❖ Lauren Tokarcik (external hire) to 428/Earth Science Mission Operations project, Resources Analyst

Goings:

- ❖ Val Lutz (from 400) to 763/WFFIT & Communications Branch
- ❖ Bob Spiess retired from 453/NEN, Deputy Project Manager for Formulation
- ❖ Mary “Kathy” Shifflett retired from 420/Earth Science Projects Division, Program Business Manager
- ❖ Michael S. Seablom (from 407) transferred to NASA Headquarters

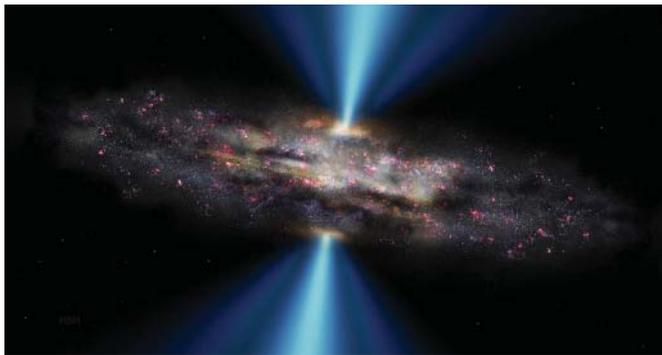
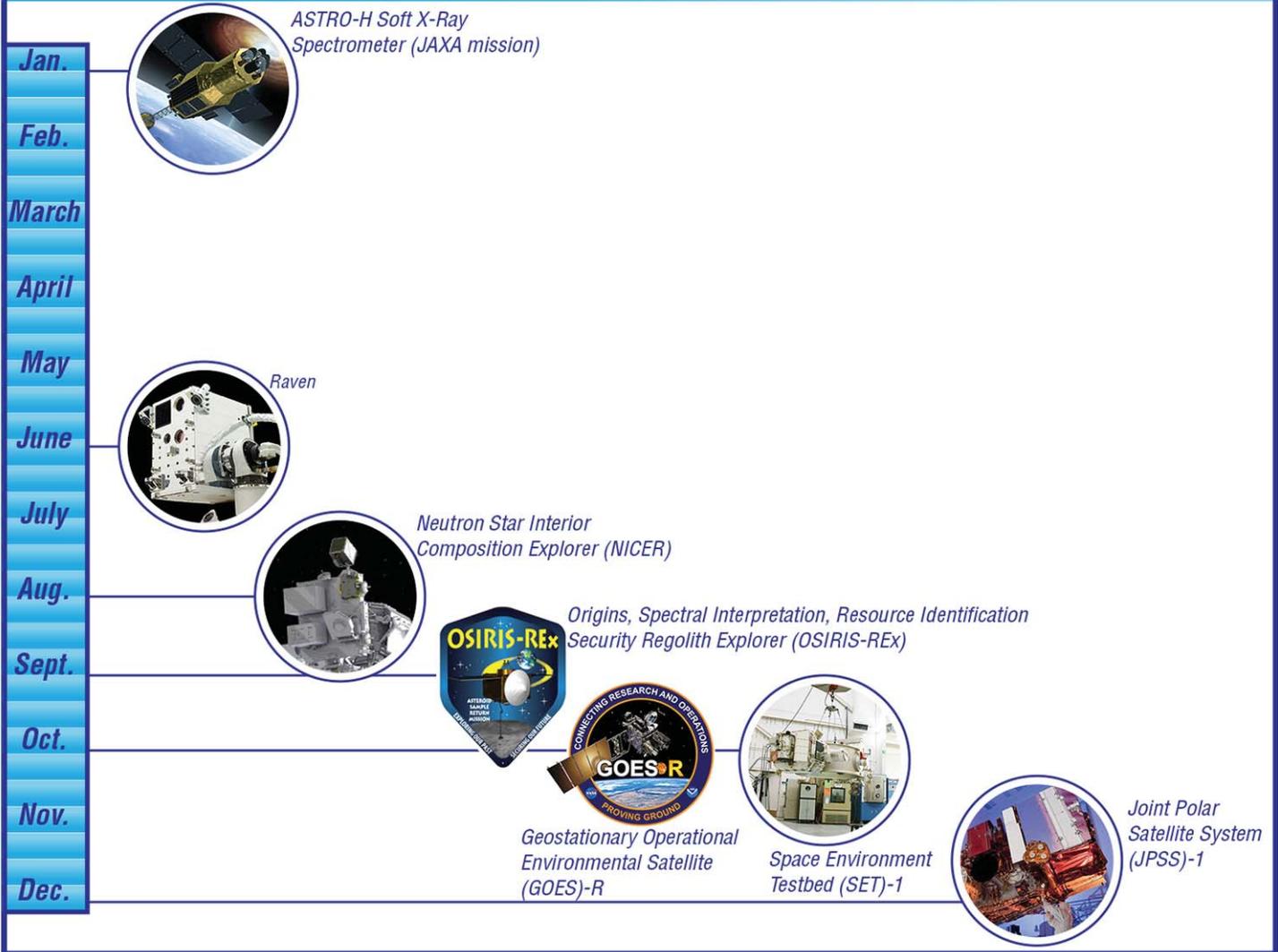
- ❖ Marshall H. Sutton (from 405) detail to 586/DSCOVER, Science Data Processing
- ❖ Monique S. Collins (from 408) detail to 157.1/Financial Services Section
- ❖ Charlette M. Johnson (from 490) to 201/Resources Analyst

Reassignments/Realignments/Details within Code 400:

- ❖ Kimberley Ruth (from 472) to 470/JPSS program, Program Specialist
- ❖ Miles C. Glasgow to 451/Laser Communications Relay Demonstration project, Senior Resources Analyst
- ❖ Thomas V. McCarthy (from 420) to 400/Flight Projects Directorate, Deputy Director
- ❖ Steven J. Horowitz (from 460) to 440/Astrophysics Projects Division, Study Manager
- ❖ Nicole D. Turner (from 472) to 401/Advanced Concepts & Formulation Office, Deputy Project Manager-Resources
- ❖ Jonathan H. White (from 403) to 472/JPSS Flight project, Financial Manager
- ❖ Jeffrey J. Gramling (from 454) detail to 420/Earth Science Projects Division, Deputy Program Manager
- ❖ Aaron C. McCleskey (from 474) to 490/Instrument Projects Division, GEDI Sr. Resources Analyst
- ❖ Elizabeth A. Park to 472/JPSS Flight, Mission Manager
- ❖ Tom J. Venator (from 426) to 408/Satellite Servicing Capabilities Office (SSCO), Observatory Manager
- ❖ Joyce A. King (from 450) to 460/Explorers GOLD Mission Manager
- ❖ Albert G. Vernacchio (from 426) to 448/AFTA (WFIRST) project, Deputy Payload Systems Manager
- ❖ Jeffrey D. Hein (from 420) to 472/JPSS Flight Project, Instrument Manager
- ❖ Michael J. Scott to 472/JPSS Flight project, Instrument Systems Manager

***Lisa Hoffmann, Code 400
Administrative Officer***

Flight Projects Launch Schedule 2016



Best wishes for the holiday season from the staff at The Critical Path

We're on the Web!

Visit the new Code 400 home page
<http://fpd.gsfc.nasa.gov>

The Critical Path

Published by the Flight Projects Directorate

— In April, August, and December —

Prepared by:

**Laura Paschal
 Paula L. Wood
 Herbert Eaton**

If you have a story idea, news item, or letter for *The Critical Path*, please let us know about it.

Send your input to Paula Wood at
Paula.L.Wood@nasa.gov,
 Mail: Code 460, or phone Ext. 6-9125.

Don't forget to include your name and phone number.
 The deadline for the next issue is March 18, 2016