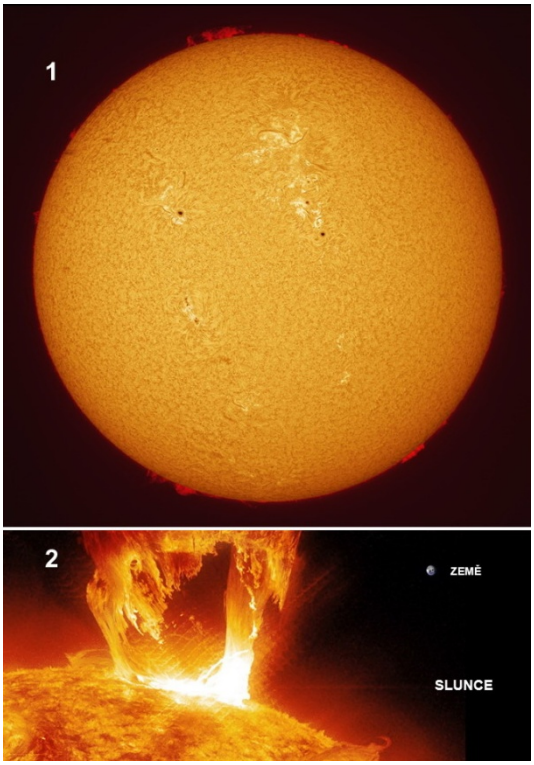
VÝSTAVA NOVÁ ASTRONOMIE, HVĚZDÁRNA ZLÍN, PROSINEC 2013

1) **Slunce**



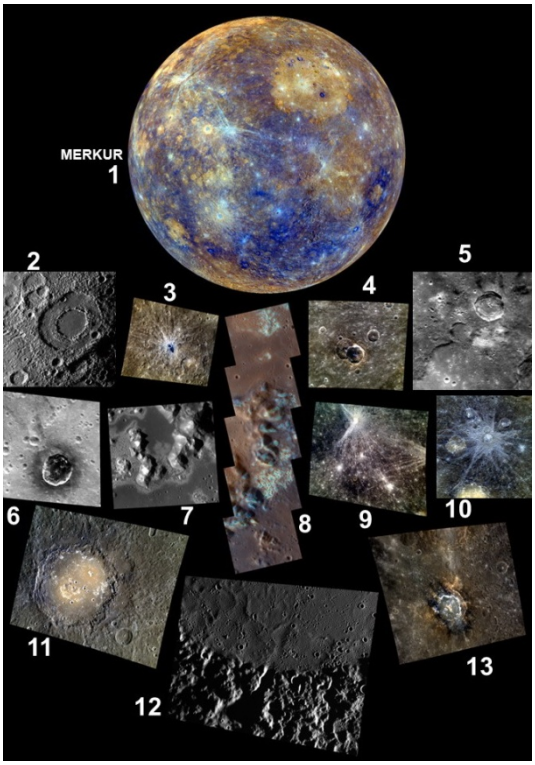
(1) http://www.avertedimagination.com/img_pages/deepbluesea3.html
I set my solar equipment up at Mount Wilson the day before the Transit of Venus and ran a test to make sure that everything had survived the trip and was working well. I forgot about the short test video I took until today. The seeing was superb... definitely the best of the visit and among the best solar conditions I've ever experienced. This image shows full capture size of the new Grasshopper Express 6 megapixel camera with my Astro-Physics Stowaway refractor and Solarmax 90 filter, working at a focal length of .9 meters.

Alan Friedman: My main solar imaging rig is named Little Big Man... it's the smallest 90mm hydrogen alpha telescope on the planet (I think!) It is shown here set up for high magnification shooting... from the front of the scope - 90mm Coronado Solarmax Ha filter with T-max tuner/ Astro-Physics 92mm f4.8 Stowaway - a very fine triplet apochramtic refractor/ Coronado BF30 blocking filter/ Baader FFC fluorite barlow/ extension tube/ Point Grey Research camera/ firewire connection to my Mac laptop for image capture. Little Big Man is shown riding on my Astro-Physics 900 German equatorial mount. All images are captured and processed on a Macintosh computer using Astro IIDC software by Milton Aupperle.

(2) http://www.nasa.gov/mission_pages/sunearth/news/News041612-M1.7flare.html
An eruption on April 16, 2012 was captured here by NASA's Solar Dynamics Observatory in the 304 Angstrom wavelength, which is typically colored in red. Credit: NASA/SDO/AIA. A beautiful prominence eruption producing a coronal mass ejection (CME) shot off the east limb (left side) of the sun on April 16, 2012. Such eruptions are often associated with solar flares, and in this case an M1 class (medium-sized) flare occurred at the same time, peaking at 1:45 PM EDT. The CME was not aimed toward Earth.

The Solar Dynamics Observatory (SDO) is a NASA mission which will observe the Sun for over five years. Launched on February 11, 2010, the observatory is part of the Living With a Star (LWS) program. The goal of the LWS program is to develop the scientific understanding necessary to effectively address those aspects of the connected Sun–Earth system directly affecting life and society. The goal of the SDO is to understand the influence of the Sun on the Earth and near-Earth space by studying the solar atmosphere on small scales of space and time and in many wavelengths simultaneously. SDO has been investigating how the Sun's magnetic field is generated and structured, how this stored magnetic energy is converted and released into the heliosphere and geospace in the form of solar wind, energetic particles, and variations in the solar irradiance.

2) Merkur



MESSENGER (an acronym of MErcury Surface, Space ENvironment, GEochemistry, and Ranging) is a robotic NASA spacecraft orbiting the planet Mercury, the first spacecraft ever to do so. The 485-kilogram spacecraft was launched aboard a Delta II rocket in August 2004 to study Mercury's chemical composition, geology, and magnetic field. It became the second mission after 1975's Mariner 10 (launched by NASA on November 3, 1973) to reach Mercury successfully when it made a flyby in January 2008, followed by a second flyby in October 2008, and a third flyby in September 2009.

The instruments carried by MESSENGER were tested on a complex series of flybys – the spacecraft flew by Earth once, Venus twice, and Mercury itself three times, allowing it to decelerate relative to Mercury using minimal fuel. MESSENGER successfully entered Mercury's orbit on March 18, 2011, and reactivated its science instruments on March 24, returning the first photo from Mercury orbit on March 29.

MESSENGER's formal data collection mission began on April 4, 2011. The primary mission was completed on March 17, 2012, having collected close to 100,000 images. MESSENGER achieved 100% mapping of Mercury on March 6, 2013, and completed its first year-long extended mission on March 17, 2013. It is awaiting approval of a second one-year extension as of July 2013.
During its stay in Mercury orbit, MESSENGER's instruments have yielded significant data, including a characterization of Mercury's magnetic field and the discovery of water ice at the planet's north pole, which had long been suspected on the basis of Earth-based radar data.

(1) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=2&gallery_id=2&image_id=1095&keyword=73&search_cat=

Colors of the Innermost Planet: View 1
Release Date: February 18, 2013
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
Center Latitude: 0°
Center Longitude: 140° E
Scale: Mercury's diameter is 4880 kilometers
Map Projection: orthographic

This colorful view of Mercury was produced by using images from the color base map imaging campaign during MESSENGER's primary mission. These colors are not what Mercury would look like to the human eye, but rather the colors enhance the chemical, mineralogical, and physical differences between the rocks that make up Mercury's surface. Young crater rays, extending radially from fresh impact craters, appear light blue or white. Medium- and dark-blue areas are a geologic unit of Mercury's crust known as the "low-reflectance material", thought to be rich in a dark, opaque mineral. Tan areas are plains formed by eruption of highly fluid lavas. The giant Caloris basin is the large circular tan feature located just to the upper right of center of the image.

(2) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=11&search_type=and&image_id=1076&keyword=66&search_cat=

Turtle Power!
Date acquired: March 26, 2012
Image Mission Elapsed Time (MET): 241236952
Image ID: 1566240
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Center Latitude: -44.13°
Center Longitude: 251.5° E
Resolution: 369 meters/pixel
Scale: Michelangelo basin is approximately 230 km in diameter.
Incidence Angle: 83.6°
Emission Angle: 37.6°
Phase Angle: 67.5°

Here, the peak-ringed Michelangelo basin is seen close to the terminator. Hawthorne crater (outside this image field of view past the upper right corner) may be the source of the secondary crater chains that cross through the basin. North is towards the bottom of this image. This image was acquired as a high-resolution targeted observation. Targeted observations are images of a small area on Mercury's surface at resolutions much higher than the 200-meter/pixel morphology base map. It is not possible to cover all of Mercury's surface

at this high resolution, but typically several areas of high scientific interest are imaged in this mode each week

(3) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=13&search_type=and&image_id=764&keyword=70&search_cat=

Say Aah!
Date acquired: May 16, 2011
Image Mission Elapsed Time (MET): 214069807, 214069811, 214069815
Image ID: 261719, 261720, 261721
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filters: 9, 7, 6 (996, 748, 433 nanometers) in red, green, and blue
Center Latitude: -8.82°
Center Longitude: 254.9° E
Resolution: 294 meters/pixel
Scale: The center crater has a diameter of approximately 14 kilometers
Incidence Angle: 41.8°
Emission Angle: 25.6°
Phase Angle: 67.4°

This high-resolution color image shows a 14-kilometer diameter crater that is relatively young, as indicated by the bright rays that cross the neighboring features. A dark "tongue" of impact melt, which has a bluer color than the nearby surface, appears to have flowed out of the crater. This image was acquired as a high-resolution targeted observation. Targeted observations are images of a small area on Mercury's surface at resolutions much higher than the 250-meter/pixel (820 feet/pixel) morphology base map or the 1-kilometer/pixel (0.6 miles/pixel) color base map. It is not possible to cover all of Mercury's surface at this high resolution during MESSENGER's one-year mission, but several areas of high scientific interest are generally imaged in this mode each week

(4) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=4&search_type=and&image_id=899&keyword=92&search_cat=

A Light and Dark Duo
Date acquired: June 16, 2012
Image Mission Elapsed Time (MET): 248375300, 248375292, 248375296
Image ID: 2029102, 2029100, 2029101
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filters: 9, 7, 6 (996, 748, 433 nanometers) in red, green, and blue
Center Latitude: 36.79°
Center Longitude: 166.8° E
Resolution: 205 meters/pixel
Scale: The center crater is 40 km in diameter
Incidence Angle: 36.7°
Emission Angle: 0.1°
Phase Angle: 36.7°

Here we have a color view of two unnamed craters in Caloris basin. The false color emphasizes the contrast between the hollows and LRM on the craters' floors. In the upper right, the many graben and fractures in the Caloris floor material can be seen.

This image was acquired as part of MDIS's high-resolution 3-color imaging campaign. The 3-color campaign is a major mapping activity in MESSENGER's extended mission. It complements the 8-color base map (at an average resolution of 1 km/pixel) acquired during MESSENGER's primary mission by imaging Mercury's surface in a subset of the color filters at the highest resolution possible. The three narrow-band color filters are centered at wavelengths of 430 nm, 750 nm, and 1000 nm, and image resolutions generally range from 100 to 400 meters/pixel in the northern hemisphere.

(5) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=5&search_type=and&image_id=593&keyword=92&search_cat=

Mercury's Surface Variety
Date acquired: July 13, 2011
Image Mission Elapsed Time (MET): 219009759
Image ID: 497191
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Center Latitude: 8.93°
Center Longitude: 91.56° E
Resolution: 180 meters/pixel
Scale: The large crater in this image is approximately 23 km in diameter.
Incidence Angle: 42.8°
Emission Angle: 3.0°
Phase Angle: 39.8°

This area, previously unseen during the Mariner 10 and MESSENGER flybys, was captured by MESSENGER's Narrow Angle Camera (NAC) in orbit. The view presents both contrasting albedo materials as well as contrasting terrain types. The image includes smooth plains along the left edge and a more rugged surface to the right. A 23-km-diameter impact crater sits between exposures of low reflectance material (LRM) to the east and patches of high albedo material to its west. This image was acquired as part of MDIS's high-resolution surface morphology base map. The surface morphology base map will cover more than 90% of Mercury's surface with an average resolution of 250 meters/pixel (0.16 miles/pixel or 820 feet/pixel). Images acquired for the surface morphology base map typically have off-vertical Sun angles (i.e., high incidence angles) and visible shadows so as to reveal clearly the topographic form of geologic features.

(6) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=2&search_type=and&image_id=1112&keyword=71&search_cat=

Istanbul (Not Constantinople)
Date acquired: February 25, 2013
Image Mission Elapsed Time (MET): 4159492
Image ID: 3589683
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Center Latitude: -13.85°
Center Longitude: 26.56° E
Resolution: 71 meters/pixel
Scale: Berkel crater is approximately 24 km in diameter.
Incidence Angle: 30.3°
Emission Angle: 29.3°
Phase Angle: 52.6°

Berkel crater, named for Turkish painter and printmaker Sabri Berkel, is a complex crater that sits inside of the larger Ellington basin. Berkel's interior contains material that is darker than the surrounding terrain, as well as hollows, indicating the presence of dark material at depth. This image was acquired as a targeted set of stereo images. Targeted stereo observations are acquired at resolutions much higher than that of the 200-meter/pixel stereo base map. These targets acquired with the NAC enable the detailed topography of Mercury's surface to be determined for a local area of interest.

(7) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=3&search_type=and&image_id=1191&keyword=90&search_cat=

Look, It's a Sublimation Formation!
Date acquired: August 08, 2011
Image Mission Elapsed Time (MET): 221282722
Image ID: 605799
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Center Latitude: 10.52°
Center Longitude: 114.3° E
Resolution: 24 meters/pixel
Scale: The image is about 28 km wide.
Incidence Angle: 67.5°
Emission Angle: 17.1°
Phase Angle: 50.4°

Located in the crater Eminescu, this high-resolution image shows part of the mountainous peak ring, as well as an example of the extensive formation of hollows located within the crater. Hollows maintain an air of mystery in the realm of planetary science. Though the exact formation mechanism is unknown, most scientists agree sublimation of volatiles holds the answer. This image highlights the prevalence of these hollows on and around the peak ring, as well as captures the beauty of such enigmatic formations. This image was acquired as a high-resolution targeted observation. Targeted observations are images of a small area on Mercury's surface at resolutions much higher than the 200-meter/pixel morphology base map. It is not possible to cover all of Mercury's surface at this high resolution, but typically several areas of high scientific interest are imaged in this mode each week.

(8) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=11&search_type=and&image_id=655&keyword=90&search_cat=

Sublime Sublimation, Not Subliminal
Date Presented: September 29, 2011, at a NASA press briefing
Instrument: Mercury Dual Imaging System (MDIS)

View of a section of the floor and peak-ring mountains of the Raditladi impact basin, including the area in a previous Gallery image. The individual frames in the mosaic are about 20 km wide. The rounded, depressions, called "hollows" are a fascinating discovery of MESSENGER's orbital mission and may have been formed by sublimation of a component of the material when exposed by the Raditladi impact. This image was created by merging high-resolution monochrome images from MESSENGER's Narrow Angle Camera with a lower-resolution enhanced-color image obtained by the Wide Angle Camera.

(9) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=2&search_type=and&image_id=1200&keyword=64&search_cat=

HooRAY for Craters!
Date acquired: June 05, 2013
Image Mission Elapsed Time (MET): 12743939, 12743931, 12743927
Image ID: 4199991, 4199989, 4199988
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filters: 9, 7, 6 (996, 748, 433 nanometers) in red, green, and blue
Center Latitude: -7.76°
Center Longitude: 165.3° E
Resolution: 421 meters/pixel
Scale: Image width is about 509 km
Incidence Angle: 8.3°
Emission Angle: 32.8°
Phase Angle: 28.0°

This image emphasizes the beautiful rays of Qi Baishi, in the top of the image. The crater was named for the Chinese painter, Qi Baishi, known for his whimsical watercolors. The extensive rays of the crater mimic such whimsicality, extending far from the impact, exposing new material across the scene. The bright ray system indicates that Qi Baishi is relatively young, compared to other visible features. Notice the lack of rays extending from the west of the crater. This asymmetry indicates that the impactor struck at a relatively low incidence angle from the west. This image was acquired as a targeted high-resolution 11-color image set. Acquiring 11-color targets is a new campaign that began in March 2013 and that utilizes all of the WAC's 11 narrow-band color filters. Because of the large data volume involved, only features of special scientific interest are targeted for imaging in all 11 colors.

(10) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=3&search_type=and&image_id=1038&keyword=64&search_cat=

Blue Rays
Date acquired: April 12, 2011
Image Mission Elapsed Time (MET): 211111707, 211111727, 211111711
Image ID: 122544, 122549, 122545
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filters: 9, 7, 6 (996, 748, 433 nanometers) in red, green, and blue
Center Latitude: 21.31°
Center Longitude: 308.8° E
Resolution: 401 meters/pixel
Scale: The bright-rayed crater Bek is 32 km in diameter
Incidence Angle: 25.8°
Emission Angle: 30.0°
Phase Angle: 55.9°

The beautiful blue rays of Bek dominate this scene, covering nearby craters with wisps of fresh material. Lermontov crater, seen at the bottom of the image, is thought to have been the site of explosive volcanic eruptions. The images in this mosaic were acquired as high-resolution targeted color observations. Targeted color observations are images of a small area on Mercury's surface at resolutions higher than the 1-kilometer/pixel 8-color base map. During MESSENGER's one-year primary mission, hundreds of targeted color observations were obtained. During MESSENGER's extended mission, high-resolution targeted color

observations are more rare, as the 3-color base map is covering Mercury's northern hemisphere with the highest-resolution color images that are possible.

(11) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=1&search_type=and&image_id=1214&keyword=90&search_cat=

The Poet of the Caucasus
Date acquired: February 12, 2013
Image Mission Elapsed Time (MET): 3010537, 3010557, 3010541
Image ID: 3507773, 3507778, 3507774
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filters: 9, 7, 6 (996, 748, 433 nanometers) in red, green, and blue
Center Latitude: 15.05°
Center Longitude: 312.1° E
Resolution: 282 meters/pixel
Scale: The larger crater, Lermontov, is 166 km in diameter.
Incidence Angle: 49.3°
Emission Angle: 28.7°
Phase Angle: 78.0°

The crater Lermontov is named after a 19th century Russian poet, Mikhail Lermontov, who is sometimes called "the poet of the Caucasus." The color variations and irregular depressions suggest that this crater was once home to explosive volcanism. The crater also has small bright "spots" on its floor that are interpreted to be hollows. This image was acquired as a high-resolution targeted color observation. Targeted color observations are images of a small area on Mercury's surface at resolutions higher than the 1-kilometer/pixel 8-color base map. During MESSENGER's one-year primary mission, hundreds of targeted color observations were obtained. During MESSENGER's extended mission, high-resolution targeted color observations are more rare, as the 3-color base map covered Mercury's northern hemisphere with the highest-resolution color images that are possible.

(12) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=6&search_type=and&image_id=1058&keyword=63&search_cat=

A Tale of Two Terrains
Date acquired: December 05, 2011
Image Mission Elapsed Time (MET): 231567383
Image ID: 1097256
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filter: 7 (748 nanometers)
Center Latitude: 67.16°
Center Longitude: 99.57° E
Resolution: 95 meters/pixel
Scale: The scene is about 124 km across.
Incidence Angle: 86.3°
Emission Angle: 37.5°
Phase Angle: 123.9°

This image shows a southern portion of the Mendelssohn impact basin. The smooth plains in the top (north) half of the image contrast sharply with the rugged, heavily cratered geological unit that forms the basin rim. The smooth plains were formed by eruption of highly fluid lavas that covered the basin floor. The Sun was low on the horizon when the image was captured,

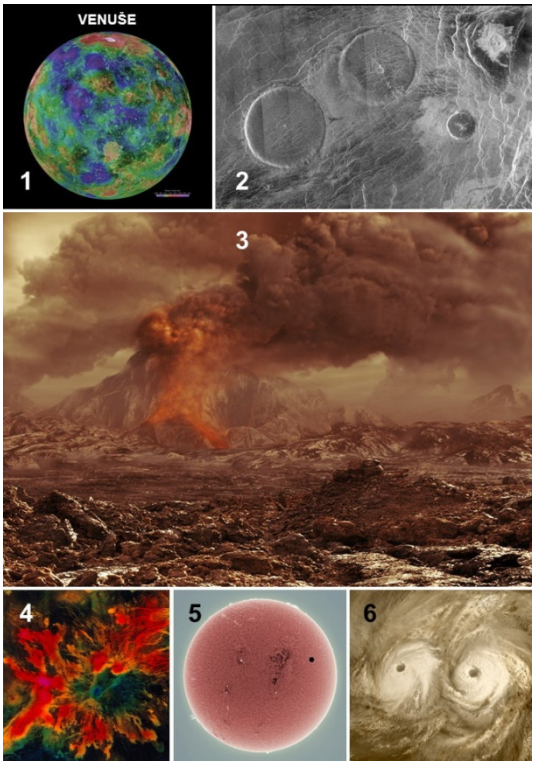
and the resulting shadows reveal the presence of ridges in the plains that mark the rims of impact craters buried by the lavas. This image was acquired as part of MDIS's high-resolution surface morphology base map. The surface morphology base map covers more than 99% of Mercury's surface with an average resolution of 200 meters/pixel. Images acquired for the surface morphology base map typically are obtained at off-vertical Sun angles (i.e., high incidence angles) and have visible shadows so as to reveal clearly the topographic form of geologic features.

(13) http://messenger.jhuapl.edu/gallery/sciencePhotos/image.php?page=4&search_type=and&image_id=969&keyword=92&search_cat=

One Rock, Two Rocks, Red Rocks, Blue Rocks
Date acquired: August 18, 2011
Image Mission Elapsed Time (MET): 222190048, 222190044, 222190040
Image ID: 648749, 648748, 648747
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
WAC filters: 9, 7, 6 (996, 748, 433 nanometers) in red, green, and blue
Center Latitude: 8.40°
Center Longitude: 33.66° E
Resolution: 211 meters/pixel
Scale: Seuss crater is approximately 67 km in diameter.
Incidence Angle: 17.3°
Emission Angle: 34.6°
Phase Angle: 50.3°

This complex crater was recently named to honor Theodor Seuss Geisel, better known as Dr. Seuss. Seuss crater is relatively fresh, its floor contains impact melt and hollows, and the impact has excavated materials with different color characteristics. These characteristics make the crater very interesting, slightly odd, and colorful in appearance, much like Seuss's illustrations. This image was acquired as a high-resolution targeted color observation. Targeted color observations are images of a small area on Mercury's surface at resolutions higher than the 1-kilometer/pixel 8-color base map. During MESSENGER's one-year primary mission, hundreds of targeted color observations were obtained. During MESSENGER's extended mission, high-resolution targeted color observations are more rare, as the 3-color base map is covering Mercury's northern hemisphere with the highest-resolution color images that are possible.

3) Venuše



(1) http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA00157
The hemispheric view of Venus, as revealed by more than a decade of radar investigations culminating in the 1990-1994 Magellan mission, is centered at 0 degrees east longitude. The Magellan spacecraft imaged more than 98% of Venus at a resolution of about 100 meters; the effective resolution of this image is about 3 km. A mosaic of the Magellan images (most with illumination from the west) forms the image base. Gaps in the Magellan coverage were filled with images from the Earth-based Arecibo radar in a region centered roughly on 0 degree latitude and longitude, and with a neutral tone elsewhere (primarily near the south pole). The composite image was processed to improve contrast and to emphasize small features, and was color-coded to represent elevation. Gaps in the elevation data from the Magellan radar altimeter were filled with altimetry from the Venera spacecraft and the U.S. Pioneer Venus missions. An orthographic projection was used, simulating a distant view of one hemisphere of the planet. The Magellan mission was managed for NASA by Jet Propulsion Laboratory (JPL), Pasadena, CA. Data processed by JPL, the Massachusetts Institute of Technology, Cambridge, MA, and the U.S. Geological Survey, Flagstaff, AZ.

(2) http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA00084
Venus - Eistla Region
This Magellan full resolution mosaic, centered at 12.3 north latitude, 8.3 degrees east longitude, shows an area 160 kilometers by 250 kilometers in the Eistla region of Venus. The prominent circular features are volcanic domes, 65 kilometers in diameter with broad, flat tops less than one kilometer in height. Sometimes referred to as 'pancake' domes, they represent a unique category of volcanic extrusions on Venus formed from viscous (sticky) lava. The cracks and pits commonly found in these features result from cooling and the withdrawal of lava. A less viscous flow was emitted from the northeastern dome toward the other large dome in the southwest corner of the image.

(3) http://spaceinimages.esa.int/Images/2012/11/Is_Venus_volcanically_active
Artist's impression of an active volcano on Venus. Results from a long-term study of Venus find evidence of a clear injection of sulphur dioxide into its upper atmosphere. One possible interpretation is that volcanic activity increased the sulphur dioxide component of the upper atmosphere, although an alternative is that a change in atmospheric circulation dredged up the gas.

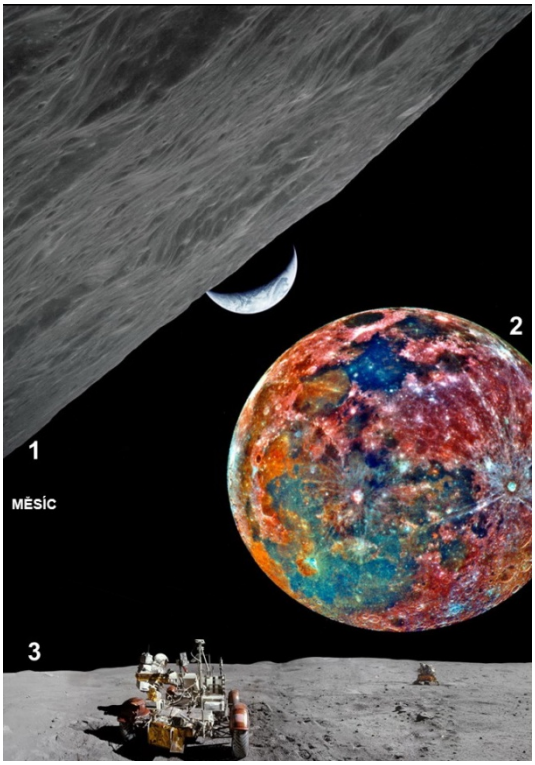
(4) http://solarsystem.nasa.gov/multimedia/display.cfm?Category=Planets&IM_ID=2032
Volcano Southeast of Phoebe Regio,Venus with Emissivity Data
Date: 11 Nov 1992
Magellan press release image showing radio-thermal emission (emissivity). Red represents high emissivity and blue low.

The image is centered at 12.5S,261E, southeast of Phoebe Regio, Venus and is 587 km on a side. The unnamed volcano is about 2 km high and shows low emissivity at the summit, which could indicate the presence of pyrrohtite or pyrite, minerals which may not be stable at lower altitudes. (Magellan press release P-40698)

(5) http://www.avertedimagination.com/img_pages/transitofvenus.html
Alan Friedman: The Sun with Venus in transit, from Mount Wilson Observatory,
June 5, 2012.

(6) http://spaceinimages.esa.int/Images/2006/04/Artist_s_view_of_atmospheric_vortex_over_Venus_North_pole
Artist's view of atmospheric vortex over Venus' North pole
Two enormous atmospheric vortices with very complex shapes and behaviour rotate vertically over the poles of Venus, recycling the atmosphere downwards. The vortex at the North pole, shown in this artist's impression, is the only one previously studied in some detail and has a peculiar 'double-eye' shape, surrounded by a collar of hot air. This vortex completes a full rotation in only three days. Venus Express' observations will help understand how the stormy atmospheric circulation on Venus work.

4) Měsíc



(1) http://www.lpi.usra.edu/resources/apollo/frame/?AS17-152-23274
The crescent Earth rises above the lunar horizon in this spectacular photograph taken from the Apollo 17 spacecraft in lunar orbit during final lunar landing mission in the Apollo program.

Let Apolla 17 se uskutečnil 7. – 19. prosince 1972. Poslední let Apolla k Měsíci, první noční start, jediná mise s profesionálním geologem. Na povrch Měsíce vystoupil Eugene Cernan a Harrison Schmitt.

Apollo 17, poslední let programu Apollo, je a na dlouhá léta ještě zůstane posledním letem člověka na Měsíc. Byl 43. lodí s kosmonauty z naší planety, označen dle COSPAR 1972-096A. Zatímco velitelský modul America s Ronem Evansem na palubě pokračoval v obletech Měsíce (celkem 75 obletů), lunární modul Challenger s posádkou Eugene A. Cernan a Harrison Schmitt přistál 11. prosince 1972 na povrchu Měsíce v údolí Taurus-Littrov v měsíčním Mare Serenitatis. Den předtím dopadl na povrch asi 350 km odtud poslední stupeň nosné rakety Saturn. Posádka strávila na povrchu Měsíce celkem 75 hodin. Během této doby uskutečnila 3 výstupy na povrch Měsíce v celkovém trvání 22 hodin a 4 minuty, při nichž prozkoumala s použitím lunárního vozítka Lunar Rover celkem 33,8 km údolí Taurus-Littrov. Na Zemi dopravila celkem 110,5 kg vzorků měsíční horniny.

Během návratu k Zemi uskutečnil pilot velitelského modulu Ronald Evans výstup (tzv. EVA) do otevřeného vesmíru v délce 1 hodiny a 6 minut, při němž vyjmul z kamery umístěné na vnějším plášti Apolla 17 tři kazety s naexponovaným filmem. Velitel Apolla 17 Eugene A. Cernan se zapsal do historie jako poslední člověk, který zanechal své stopy na Měsíci. Během svých procházek po povrchu měl s sebou také československou vlajku jako symbol svého vztahu k předkům, pocházejícím z Čech a ze Slovenska, kterou později věnoval Astronomickému ústavu AV ČR v Ondřejově.

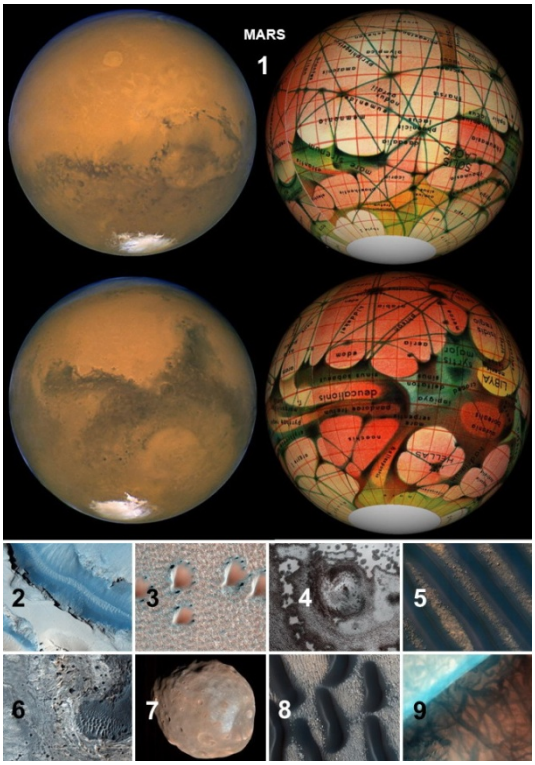
(2) http://www.solarviews.com/cap/moon/moonfls1.htm
This false-color photograph is a composite of 15 images of the Moon taken through three color filters by Galileo's solid- state imaging system during the spacecraft's passage through the Earth- Moon system on December 8, 1992. When this view was obtained, the spacecraft was 425,000 kilometers from the Moon and 69,000 kilometers from Earth. The false-color processing used to create this lunar image is helpful for interpreting the surface soil composition. Areas appearing red generally correspond to the lunar highlands, while blue to orange shades indicate the ancient volcanic lava flow of a mare, or lunar sea. Bluer mare areas contain more titanium than do the orange regions. Mare Tranquillitatis, seen as a deep blue patch on the right, is richer in titanium than Mare Serenitatis, a slightly smaller circular area immediately adjacent to the upper left of Mare Tranquillitatis. Blue and orange areas covering much of the left side of the Moon in this view represent many separate lava flows in Oceanus Procellarum. The small purple areas found near the center are pyroclastic deposits formed by explosive volcanic eruptions. The fresh crater Tycho, with a diameter of 85 kilometers, is prominent at the bottom of the photograph, where part of the Moon's disk is missing.

(3) http://www.lpi.usra.edu/resources/apollopanoramas/pans/?pan=JSC2011e118362
NASA File Number: JSC2011e118362
Description: Apollo 16 view from Station 10
Feature(s): ALSEP
LM, LRV, Smoky Mountain, Stone Mountain
Let Apolla 16 se uskutečnil 16. – 27. dubna 1972. První přistání na měsíční vrchovině.
Na povrch Měsíce vystoupil John Young a Charles Duke.

Po odletu z oběžné dráhy Země loď odletěla na oběžnou dráhu Měsíce, kam dospěla po třech dnech. Následovalo navedení na dráhu, na které zůstala kroužit samotná loď Casper s Mattinglym, kdežto lunární modul Orion přistál 21. dubna na povrchu Měsíce, v oblasti Cayleovy planiny asi 85 km od kráteru Descartes. Před nimi na povrch Měsíce dopadl poslední stupeň nosné rakety Saturn. Po 14 hodinách po přistání oba kosmonauti vyrazili na první procházku. Nejdříve vyložili vozítko Rover, následovala instalace malého dalekohledu s kamerou, vztyčení vlajky, instalace laboratoře ALSEP. Pak odjeli Roverem na plánované místo sběru vzorků, kde se asi hodinu zabývali geologií. Pak důkladně vyzkoušeli jízdní vlastnosti Roveru. V podobném duchu byly i další dvě procházky a vyjížďky. Byl při nich dosažen rychlostní rekord Roveru 17 km/h.

Rover při odletu z Měsíce 24. dubna zanechali se zapnutou kamerou pro přímý televizní přenos pro diváky na Zemi na místě. S mateřskou lodí se spojili po dvou hodinách. Oproti předchozím letům z technických důvodů nezůstali kroužit po orbitální dráze Měsíce. Pro chybu v nastavení se nepodařilo navést LM na povrch Měsíce. Vypustili malou družici, ale i ta nedosáhla plánované výšky oběhů, a proto zanikla předčasně po 30 dnech (plán byl rok). Dne 25. dubna odstartovali z orbity u Měsíce zpět k Zemi. Po cestě Mattingly vystoupil z lodi (výstup EVA), aby přinesl kazety s filmovým a biologickým materiálem.

5) Mars



(1) http://apod.nasa.gov/apod/ap031112.html

Jsou na Marsu kanály? To bylo téma ohnivé debaty konce 19. století, kdy několik prominentních astronomů včetně Percivala Lowella nejen že tvrdilo, že na Marsu vidí rozsáhlé soustavy dlouhých přímých kanálů, ale používali je i jako důkazy pro existenci inteligentního života. Poměrně blízká opozice v roce 1894 byla využita pro kresby, jako je ta digitálně pozměněným měřítkem vpravo dole. Tato mapa byla původně připravena Eugenem Antoniadim a pak ji pro knihu Exploring Mars, kterou napsal Roy A. Gallant, překreslil Lowell Hess. V současné době poslední opozice Marsu umožnila kosmickému dalekohledu Hubble Space Telescope zachytit obrázek s podobnou orientací. Srovnání obou obrázků ukazuje, že velké útvary byly zachyceny úžasně, ale že rozsáhlá soustava dlouhých a přímých kanálů prostě neexistuje. Družice Marsu nyní jednoznačně ukazují, že rudá planeta sice má povrchové útvary podobné kanálům, ale že tyto útvary jsou obvykle menší, pokroucené a ne tak rozsáhlé, než se dříve tvrdilo. Opravdové soustavy kaňonů jako je třeba Noctis Labyrinthus jsou nejspíše prasklinami způsobenými povrchovým napětím.

Mars Reconnaissance Orbiter (zkráceně MRO) je planetární sonda určená k průzkumu planety Mars z oběžné dráhy. Byla vypuštěna 12. srpna 2005, v březnu 2006 dosáhla Marsu a stala se třetí aktivní družicí Marsu (vedle sond Mars Express a Mars Odyssey).

(2) http://photojournal.jpl.nasa.gov/catalog/PIA12956

This image shows part of Cerberus Fossae, a long system of extensional (normal) faults arranged in trough-bounding (graben-bounding) pairs. Cerberus Fossae served as the source of a large volcanic eruption that draped Athabasca Valles in lava. Large boulders that have been dislodged from the graben walls are visible on the floor of Cerberus Fossae. The first subimage shows an example of an approximately 6 meter (20 feet) boulder that left a distinct track as it moved downhill. Although this track is quite clear, ripples inside the track are discernable, indicating that enough time has passed for wind activity to rework loose material

into the form of ripples. With close examination of this observation, one can see many boulder tracks, some with ripples and some without ripples. Wind streaks emanating from impact craters are visible on the plains surrounding Cerberus Fossae. The second subimage shows a false color image of an approximately 33 meters impact crater. Material on the crater floor (blue in the color image) is being moved by the wind out of the crater and across the plains. The wind streaks in this observation indicate that the predominant wind direction in this region is from East to West.

(3) http://photojournal.jpl.nasa.gov/catalog/PIA14861
This scene is from early spring in the northern hemisphere of Mars. These dunes are covered with a layer of seasonal carbon dioxide ice (dry ice). Bluish cracks in the ice are visible across the top of some of the dunes. Dark fan-shaped deposits around the edges of the dunes are at spots where the ice has sublimated (gone directly from ice to gas) and the ice layer has ruptured, allowing the sand from the dune to escape out from under the ice. The sand is then free to be blown by the wind. This image is one product from an observation by the High Resolution Imaging Science Experiment (HiRISE) camera taken on Sept. 30, 2011, at 73.3 degrees north latitude, 355.1 degrees east longitude.

(4) http://photojournal.jpl.nasa.gov/catalog/PIA13727
This 4 kilometer diameter feature near the edge of the South polar residual cap was recognized in Mariner 9 and Viking Orbiter images taken in the 1970s, but its origin could not be inferred. It was therefore targeted for HiRISE stereo imaging. The bright areas in this image are covered by carbon dioxide frost, and the "swiss cheese" terrain typical of the south polar residual cap covers much of the imaged area. The dark walls of the circular depression do not have as much frost on them, and are fractured in a polygonal pattern. Apparently the surface of the walls has been extensively modified by thermal expansion and contraction of water ice. It also appears that the "swiss cheese" terrain of the residual cap has buried the floor of the circular depression, as well as the terrain surrounding the feature, making it difficult to infer the origin of this depression. Its circular symmetry is consistent with an impact origin, but there is no evidence of a crater rim or ejecta (perhaps because they have been buried). The depression may have formed by collapse, but there is little evidence of extensional fractures that would be expected around a collapse pit. Analysis of HiRISE stereo data may help the interpretation of this feature.

(5) http://photojournal.jpl.nasa.gov/catalog/PIA12491
Dunes of sand-sized materials have been trapped on the floors of many Martian craters. This is one example, from a crater in Noachis Terra, west of the giant Hellas impact basin. The High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter captured this view on Dec. 28, 2009. The dunes here are linear, thought to be due to shifting wind directions. In places, each dune is remarkably similar to adjacent dunes, including a reddish (or dust colored) band on northeast-facing slopes. Large angular boulders litter the floor between dunes. The most extensive linear dune fields know in the solar system are on Saturn's large moon Titan. Titan has a very different environment and composition, so at meter-scale resolution they probably are very different from Martian dunes. This image covers a swath of ground about 1.2 kilometers wide, centered at 42.7 degrees south latitude, 38.0 degrees east longitude.

(6) http://photojournal.jpl.nasa.gov/catalog/PIA13608
This image shows a number of unusual, quasi-circular structures from 300 to 600 meters in diameter that apparently formed within bright flows in Meridiani Planum. The strange

structures were observed earlier in MOC image E12-01295. They are located near the equator, about 300 kilometers West of the MER rover Opportunity. New details can be seen in the HiRISE image that yield clues to the origin of these mysterious features. The dark rings seen within the concentric structures appear rougher than their surroundings. The bright material in which they formed is densely fractured, suggesting that it is quite brittle. Several small impact craters found within the bright unit produced sprays of dark ejecta, suggesting that the bright surface layer may be only a few meters thick. A compositional and morphological boundary separates the contorted central region of the unit from the smooth margins.

A full interpretation awaits detailed analysis, but these observations suggest that the lobate bright unit may have been produced by an ancient flow of water-saturated fluvial sediments. The circular structures within the flow could have formed by desiccation, as the sediments dried out and contracted, similar to mud cracks but on a much larger scale. Or they may have formed by a process of diapirism, if a solid crust formed on the surface of the drying sediments that was denser than the water-saturated slurry below. On Earth, slurries of sand and water that are pressurized by the weight of the overburden can rise to the surface to form "injectites," eruptions of sand and water that can reach heights of hundreds of meters. Whether they were formed by desiccation or injection, these unusual features record a unique moment in the distant past of Mars.

(7) http://photojournal.jpl.nasa.gov/catalog/PIA10368
The High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter took two images of the larger of Mars' two moons, Phobos, within 10 minutes of each other on March 23, 2008. This is the first, taken from a distance of about 6,800 kilometers. It is presented in color by combining data from the camera's blue-green, red, and near-infrared channels. The illuminated part of Phobos seen in the images is about 21 kilometers across. The most prominent feature in the images is the large crater Stickney in the lower right. With a diameter of 9 kilometers, it is the largest feature on Phobos. The color data accentuate details not apparent in black-and-white images. For example, materials near the rim of Stickney appear bluer than the rest of Phobos. Based on analogy with materials on our own moon, this could mean this surface is fresher, and therefore younger, than other parts of Phobos. A series of troughs and crater chains is obvious on other parts of the moon. Although many appear radial to Stickney in this image, recent studies from the European Space Agency's Mars Express orbiter indicate that they are not related to Stickney. Instead, they may have formed when material ejected from impacts on Mars later collided with Phobos. The lineated textures on the walls of Stickney and other large craters are landslides formed from materials falling into the crater interiors in the weak Phobos gravity (less than one one-thousandth of the gravity on Earth).

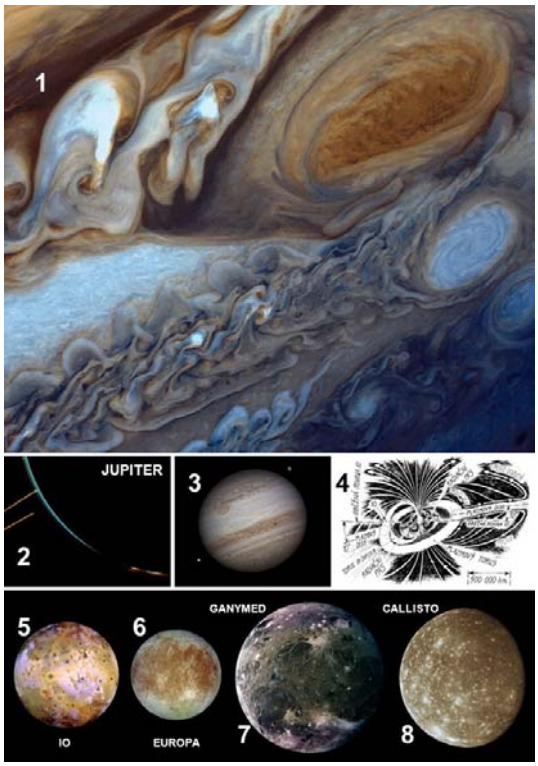
In the full-resolution version of this image, a pixel encompasses 6.8 meters, providing a resolution (smallest visible feature) of about 20 meters.

(8) http://photojournal.jpl.nasa.gov/catalog/PIA13613
This observation shows the edge of a dark dune field on the floor of Proctor Crater, a 150km diameter crater in the Southern highlands of Mars. The dark dunes are composed of basaltic sand that has collected on the bottom of the crater. Dark dune slip faces (the steeper sides of the dunes) are located on the east side of the dunes and are believed to have formed in response to fall and winter westerly winds caused by geostrophic forces (winds balanced by Coriolis and pressure gradient forces). Superimposed on their surface are smaller secondary dunes that are commonly seen on terrestrial dunes of this size. Many smaller and brighter bed

forms, most likely small dunes or granule ripples, cover the substrate between the larger dark dunes as well as most of the floor of Proctor Crater. The dark dunes overlie the small bright bedforms indicating that they formed more recently. In several areas, however, the dark dunes appear to influence the orientation of the small bright dunes, possibly by wind flowing around the larger ones, suggesting that both dark and bright bedforms are coeval. The dunes in Proctor Crater may be active today, moving in response to Martian winds.

(9) http://photojournal.jpl.nasa.gov/catalog/PIA13539
The Russell Crater dune field is covered seasonally by carbon dioxide frost, and this image shows the dune field after the frost has sublimated (evaporated directly from solid to gas). There are just a few patches left of the bright seasonal frost.
Numerous dark dust devil tracks can be seen meandering across the dunes. The face of the largest dune is lined with gullies. The source of the gullies is unclear but could involve erosion by the seasonal carbon dioxide ice.

6) Jupiter



(1) http://photojournal.jpl.nasa.gov/catalog/PIA01384
Jupiter Swirls 5 Mar 1979
This close-up of swirling clouds around Jupiter's Great Red Spot was taken by Voyager 1. It was assembled from three black and white negatives. During the Jupiter leg of their journeys, Voyager 1 and 2 each explored the giant planet, its magnetosphere and moons in far greater detail than had the Pioneer spacecraft that preceded it. Both spacecraft also used Jupiter's gravity as a springboard to Saturn and beyond.

Voyager 1, launched Sept. 5, 1977, visited Jupiter and Saturn and then angled northward. It is now the most distant human-made object. Voyager 2 also examined Jupiter and Saturn and then became the only spacecraft to visit Uranus and Neptune. Besides those four planets, the

twin spacecraft observed 48 moons. They discovered active volcanoes on Jupiter's Io, thick haze on Saturn's Titan, towering cliffs on Uranus' Miranda and geysers on Neptune's frigid Triton.

(2) http://photojournal.jpl.nasa.gov/catalog/PIA01529
Jupiter's faint ring system is shown in this color composite as two light orange lines protruding from the left toward Jupiter's limb. This picture was taken in Jupiter's shadow through orange and violet filters. The colorful images of Jupiter's bright limb are evidence of the spacecraft motion during these long exposures. The Voyager 2 spacecraft was at a range of 1,450,000 kilometers about two degrees below the plane of the ring. The lower ring image was cut short by Jupiter's shadow on the ring.

(3) http://photojournal.jpl.nasa.gov/catalog/PIA14410
Ground-based astronomers will be playing a vital role in NASA's Juno mission. Because Jupiter has such a dynamic atmosphere, images from the amateur astronomy community are needed to help the JunoCam instrument team predict what features will be visible when the camera's images are taken. This image was acquired by Damian Peach on September 12, 2010, when Jupiter was close to opposition. South is up and the "Great Red Spot" is visible. Two of Jupiter's moons, Io and Ganymede, can also be seen in this image.

(4) Hvězdy, planety, magnety – Petr Kulhánek, Jakub Rozehnal, Ivan Havlíček, MF 2007.
Magnetosféra Jupiteru je fenomén, který nemá ve sluneční soustavě obdoby.
Především se vymyká svou enormní velikostí. Ve směru ke Slunci (denní, návětrná strana) dosahuje magnetosféra až do devadesátinásobku poloměru planety. Ve směru od Slunce (noční strana) se táhne rozsáhlý magnetický ohon až k oběžné dráze Saturnu, tedy do vzdálenosti pěti astronomických jednotek! Magnetosféra je tak obrovská, že by se do ní vešlo Slunce i s korónou. Lineární rozměry magnetosféry jsou stokrát větší než rozměry magnetosféry Země, objem je větší dokonce milionkrát. Magnetický moment Jupiteru je 20000krát silnější než pozemský. Kde hledat příčiny vzniku tak extrémně veliké magnetosféry? Samozřejmě v mimořádně velikém magnetickém momentu planety. Jupiter je největší planetou sluneční soustavy (má průměr 143 760 km) a přitom se otočí kolem své rotační osy za nejkratší dobu (9 hodin a 55 minut). Rychlost přesunu mas pod povrchem planety je proto největší ve sluneční soustavě. Gravitační tlak způsobuje, že vodík je v hloubce pod 0,75 poloměru planety v kovovém stavu. Rozsáhlé rotující oblasti tekutého kovového vodíku dávají vzniknout dipólovému momentu 160×10^{18} $T\cdot m^3$ a poli na rovníku 430 μT.

(5) http://photojournal.jpl.nasa.gov/catalog/PIA02309
NASA's Galileo spacecraft acquired its highest resolution images of Jupiter's moon Io on 3 July 1999 during its closest pass to Io since orbit insertion in late 1995. This color mosaic uses the near-infrared, green and violet filters (slightly more than the visible range) of the spacecraft's camera which have been processed to enhance more subtle color variations. Most of Io's surface has pastel colors, punctuated by black, brown, green, orange, and red units near the active volcanic centers. A true color version of the mosaic has been created to show how Io would appear to the human eye.

(6) http://photojournal.jpl.nasa.gov/catalog/PIA00502
This image shows two views of the trailing hemisphere of Jupiter's ice-covered satellite, Europa. The left image shows the approximate natural color appearance of Europa. The image on the right is a false-color composite version combining violet, green and infrared images to

enhance color differences in the predominantly water-ice crust of Europa. Dark brown areas represent rocky material derived from the interior, implanted by impact, or from a combination of interior and exterior sources. Bright plains in the polar areas (top and bottom) are shown in tones of blue to distinguish possibly coarse-grained ice (dark blue) from fine-grained ice (light blue). Long, dark lines are fractures in the crust, some of which are more than 3,000 kilometers long. The bright feature containing a central dark spot in the lower third of the image is a young impact crater some 50 kilometers in diameter. This crater has been provisionally named "Pwyll" for the Celtic god of the underworld.

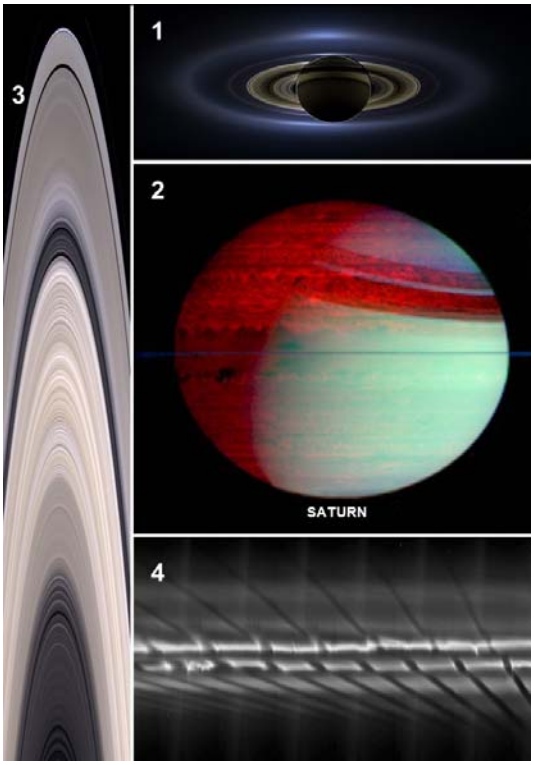
Europa is about 3,160 kilometers in diameter, or about the size of Earth's moon. This image was taken on September 7, 1996, at a range of 677,000 kilometers by the solid state imaging television camera onboard the Galileo spacecraft during its second orbit around Jupiter.

(7) http://photojournal.jpl.nasa.gov/catalog/PIA01666
In this global view of Ganymede's trailing side, the colors are enhanced to emphasize color differences. The enhancement reveals frosty polar caps in addition to the two predominant terrains on Ganymede, bright, grooved terrain and older, dark furrowed areas. Many craters with diameters up to several dozen kilometers are visible. The violet hues at the poles may be the result of small particles of frost which would scatter more light at shorter wavelengths (the violet end of the spectrum). Ganymede's magnetic field, which was detected by the magnetometer on NASA's Galileo spacecraft in 1996, may be partly responsible for the appearance of the polar terrain. Compared to Earth's polar caps, Ganymede's polar terrain is relatively vast. The frost on Ganymede reaches latitudes as low as 40 degrees on average and 25 degrees at some locations. For comparison with Earth, Miami, Florida lies at 26 degrees north latitude, and Berlin, Germany is located at 52 degrees north.

North is to the top of the picture. The composite, which combines images taken with green, violet, and 1 micrometer filters, is centered at 306 degrees west longitude. The resolution is 9 kilometers per picture element. The images were taken on 29 March 1998 at a range of 918000 kilometers by the Solid State Imaging (SSI) system on NASA's Galileo spacecraft.

(8) http://www.solarviews.com/raw/jup/callisto.jpg
The Voyager mission sent back good images of Callisto, so most of Galileo's resources were focused on areas missed in the earlier flyby. The science objectives were:
Acquiring high-resolution samples of typical cratered terrain and components of the Valhalla and Asgaard basins. Color sampling of the surface at local, regional, and global scales. Determining the surfaces photometric properties.

7) Saturn



(1) http://photojournal.jpl.nasa.gov/catalog/PIA17172

On July 19, 2013, in an event celebrated the world over, NASA's Cassini spacecraft slipped into Saturn's shadow and turned to image the planet, seven of its moons, its inner rings -- and, in the background, our home planet, Earth. With the sun's powerful and potentially damaging rays eclipsed by Saturn itself, Cassini's onboard cameras were able to take advantage of this unique viewing geometry. They acquired a panoramic mosaic of the Saturn system that allows scientists to see details in the rings and throughout the system as they are backlit by the sun. This mosaic is special as it marks the third time our home planet was imaged from the outer solar system; the second time it was imaged by Cassini from Saturn's orbit; and the first time ever that inhabitants of Earth were made aware in advance that their photo would be taken from such a great distance.

With both Cassini's wide-angle and narrow-angle cameras aimed at Saturn, Cassini was able to capture 323 images in just over four hours. This final mosaic uses 141 of those wide-angle images. Images taken using the red, green and blue spectral filters of the wide-angle camera were combined and mosaicked together to create this natural-color view. This image spans about 651,591 kilometers across. The outermost ring shown here is Saturn's E ring, the core of which is situated about 240,000 kilometers from Saturn. The geysers erupting from the south polar terrain of the moon Enceladus supply the fine icy particles that comprise the E ring; diffraction by sunlight gives the ring its blue color. Enceladus (504 kilometers across) and the extended plume formed by its jets are visible, embedded in the E ring on the left side of the mosaic. At the 12 o'clock position and a bit inward from the E ring lies the barely discernible ring created by the tiny, Cassini-discovered moon, Pallene (4 kilometers, across). The next narrow and easily seen ring inward is the G ring. Interior to the G ring, near the 11 o'clock position, one can barely see the more diffuse ring created by the co-orbital moons, Janus (179 kilometers, across) and Epimetheus (113 kilometers, across). Farther inward, we see the very bright F ring closely encircling the main rings of Saturn.

Following the outermost E ring counter-clockwise from Enceladus, the moon Tethys (1,066 kilometers across) appears as a large yellow orb just outside of the E ring. Tethys is positioned on the illuminated side of Saturn; its icy surface is shining brightly from yellow sunlight reflected by Saturn. Continuing to about the 2 o'clock position is a dark pixel just outside of the G ring; this dark pixel is Saturn's Death Star moon, Mimas (396 kilometers across). Mimas appears, upon close inspection, as a very thin crescent because Cassini is looking mostly at its non-illuminated face.

(2) http://photojournal.jpl.nasa.gov/catalog/PIA08732

This false-color mosaic of Saturn shows deep-level clouds silhouetted against Saturn's glowing interior. The image was made with data from Cassini's visual and infrared mapping spectrometer, which can image the planet at 352 different wavelengths. This mosaic shows the entire planet, including features like Saturn's ring shadows and the terminator, the boundary between day and night.

The data were obtained in February 2006 at a distance of 1.6 million kilometers from directly over the plane of Saturn's rings, which appear here as a thin, blue line over the equator. The image was constructed from images taken at wavelengths of 1.07 microns shown in blue, 2.71 microns shown in green, and 5.02 microns shown in red. The blue-green color (lower right) is sunlight scattered off clouds high in Saturn's atmosphere and the red color (upper left) is the glow of thermal radiation from Saturn's warm interior, easily seen on Saturn's night side (top left), within the shadow of the rings, and with somewhat less contrast on Saturn's day side (bottom right). The darker areas within Saturn show the strongest thermal radiation. The bright red color indicates areas where Saturn's atmosphere is relatively clear. The great variety of cloud shapes and sizes reveals a surprisingly active planet below the overlying sun-scattering haze. The brighter glow of the northern hemisphere versus the southern indicates that the clouds and hazes there are noticeably thinner than those in the south. Scientists speculate that this is a seasonal effect, and if so, it will change as the northern hemisphere enters springtime during the next few years.

(3) http://photojournal.jpl.nasa.gov/catalog/PIA06175

Saturn's most prominent feature, its dazzling ring system, takes center stage in this stunning natural color mosaic which reveals the color and diversity present in this wonder of the solar system. Gaps, gravitational resonances and wave patterns are all present, and the delicate color variations across the system are clearly visible.

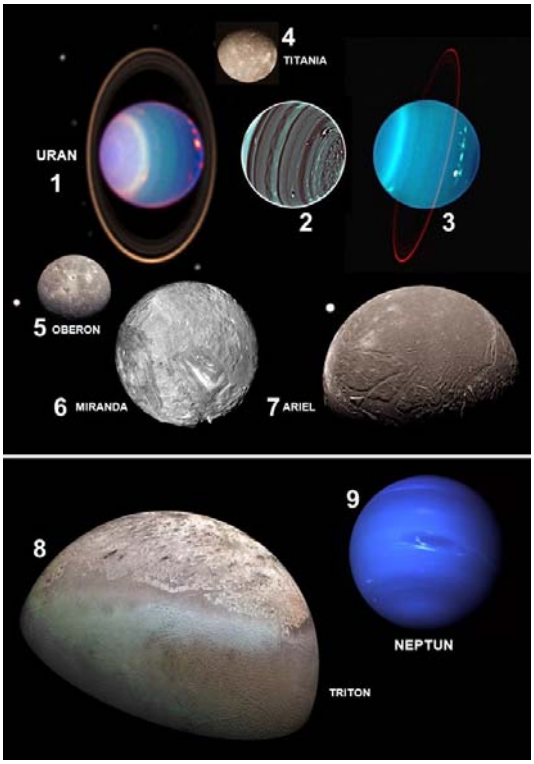
This mosaic of six images covers a distance of approximately 62,000 kilometers along the ring plane, from a radius of 74,565 kilometers to 136,780 kilometers from the planet's center. This view is from Cassini's vantage point beneath the ring plane. The rings are tilted away from Cassini at an angle of about 4 degrees. Images taken using red, green and blue spectral filters were used to create this natural color mosaic. The images were acquired using the Cassini spacecraft narrow angle camera on Dec. 12, 2004, at a distance of approximately 1.8 million kilometers. The image scale is 10.5 kilometers per pixel.

(4) http://photojournal.jpl.nasa.gov/catalog/PIA12784

From right to left in the mosaic, each fan appears dark above the bright core of the F ring near the larger, diagonal channels created by the ring's shepherding moon Prometheus. The fans can be seen developing as a series of channels within the F ring's particles. They appear to have a common origin but spread outward radially in different directions. Gravitational perturbations on ring material by a moonlet or clump of material can create these fans. The moonlet or clump orbits more or less elliptically compared to the rest of the F ring. It is probably embedded in the ring and causing the base of the fan channels to meet.

The diagonal streamer-channels are periodically created by the gravity of the potato-shaped moon Prometheus which is 148 kilometers on its longest side but is on average 86 kilometers across. The images have been re-projected in this mosaic so that the F ring appears straightened rather than curved and compressed azimuthally (along the ring). This change represents a scale compression in the horizontal direction of about 33 to one which is why Prometheus looks like a bright line.
This sequence of 10 images was taken over the span of about one hour, 14 minutes. The earliest image is on the right, and time progresses moving left in the mosaic. Each image was cropped, re-projected and placed side by side in this montage. Scale in the original images was about 6 kilometers per pixel. The images were contrast enhanced and re-projected to a scale of 33 kilometers per pixel in the mosaic's horizontal direction and one kilometer per pixel in the mosaic's vertical direction. The single, cropped inset of the clumps included here was then magnified by a factor of two. The view in the original images looked toward the northern, unilluminated side of the rings from about 26 degrees above the ring plane.
The images were taken in visible light with the Cassini spacecraft narrow-angle camera on July 5, 2008. The view was acquired at a distance of approximately 1.1 million kilometers from Saturn and at a sun-Saturn-spacecraft, or phase, angle of 34 degrees.

8) Uran, Neptun



(1) http://hubblesite.org/newscenter/archive/releases/solar-system/uranus/1998/35/
October 14, 1998: A Hubble telescope infrared view of Uranus reveals that the planet is surrounded by its four major rings and by 10 of its 17 known satellites. Hubble recently found about 20 clouds — nearly as many clouds on Uranus as the previous total in the history of modern observations. The orange-colored clouds near the prominent bright band circle the planet at more than 500 km/h. One of the clouds on the right-hand side is brighter than any other cloud ever seen on Uranus.

(2) http://www.universetoday.com/98049/uranus-has-bizarre-weather/
Here's the scene: a thick, tempestuous atmosphere with winds blowing at a clip of 900 km/h ; massive storms that would engulf continents here on Earth, and temperatures in the -220 C range. Sounds like a cold Hell, but this is the picture emerging of the planet Uranus, revealed in new high-resolution infrared images from the Keck Observatory in Hawaii, exposing in incredible detail the bizarre weather of a planet that was once thought to be rather placid.

(3) http://www.news.wisc.edu/newsphotos/uranus2.html
This figure provides examples of recent Uranus imaging with the Keck NIRC2 near-infrared camera on 11-12 July 2004 UT. These two images show opposite sides of the planet, with Uranus' north pole at 4 o'clock. Each color image is a composite in which near infrared images using J (1.26 micron), H (1.62 micron), and K' (2.1 micron) filters are assigned to blue, green, and red color components respectively. This roughly approximates the view that would be available to human vision if the response of the eye could be shifted to longer wavelengths beyond red (0.7 microns). Uranus' rings appear red in color because the K' image is boosted relative to the others to reveal atmospheric features that are strongly darkened by methane absorption in this band. The use of near IR wavelengths provides exceptional cloud contrast, which is enormously enhanced by the Keck AO system. The diameter of Uranus in these images is about 3.6 arc seconds, and the effective image resolution is probably near 0.06 arc seconds. When examined carefully, the left image reveals 13 cloud features and the right image displays over 18, for a total of 31 features in just two images. The bright white feature in the right hand image has exceptional brightness in the K' band, meaning it extends to relatively high altitude, and it strongly variable, as is the unusually large complex of clouds associated with it, both having changed dramatically by our next observing run in August 2004. The isolated relatively bright green cloud near the lower left limb in the right hand image is the very long-lived feature that oscillates in latitude. The northern hemisphere of Uranus (on the right) is coming out of a long period of darkness and is not a mirror image of the southern hemisphere, indicating that there is some response to seasonal solar radiative forcing, even though little response was expected. The zonal wind speeds are asymmetric as well as the cloud morphology.

(4) http://www.solarviews.com/cap/uranus/titania.htm
Titania is the largest moon of Uranus. It is marked by a few large impact basins, but is generally covered with small craters and very rough rocks. The above image shows a 1,600 kilometer long trench. A large double walled crater can be seen towards the top of the image. There are many faults on Titania indicating there has been internal forces molding its surface.

(5) http://www.solarviews.com/cap/uranus/oberon.htm
This image of Oberon was taken on January 24, 1986, from a distance of 660,000 kilometers. The color was reconstructed from images taken from violet, clear and green image bands. The image shows features as small as 12 kilometers on the moon's surface. Oberon is a moon of Uranus that is characterized by an old, heavily cratered, and icy surface. The surface shows little evidence of internal activity other than some unknown dark material that apparently covers the floors of many craters. This image shows several large impact craters towards the center of the image. On the limb, a high mountain rises 6 kilometers above its surroundings. There are bright rays similar to those seen on Jupiter's moon Callisto.

(6) http://www.solarviews.com/cap/uranus/miranda7.htm
This image is an orthographic image of Miranda centered at the south pole. Zero degrees logitude, which is the central longitude of the side facing Uranus, is at the bottom. The image

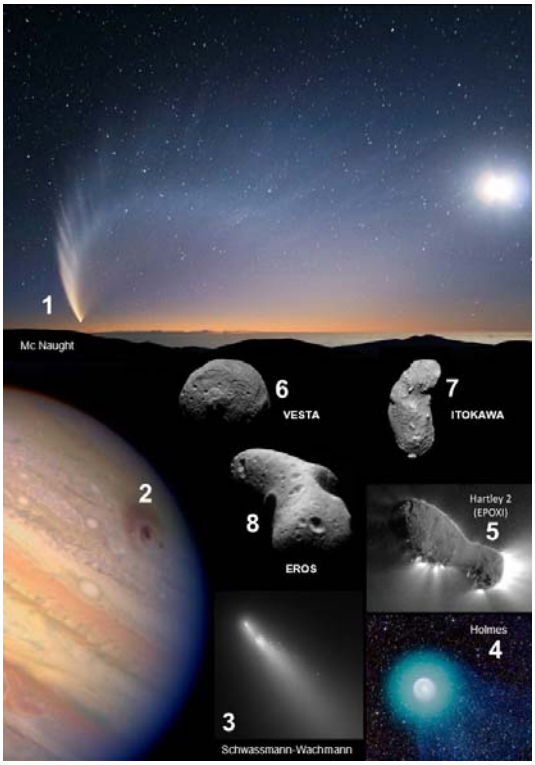
was computer-assembled from images obtained January 24, 1986, by the Voyager 2 spacecraft. Miranda is the innermost and smallest of the five major Uranian satellites, just 480 kilometers in diameter. This image is a full-disc, south-polar view of the moon showing the varying geologic provinces of Miranda. The moon's surface consists of two major strikingly different types of terrain. One is an old, heavily cratered, rolling terrain with relatively uniform albedo, or reflectivity. The other is a young, complex terrain characterized by sets of bright and dark bands, scarps and ridges. These are features found in the ovoid regions at right and left and in the distinctive chevron feature below and right of center.

(7) http://www.solarviews.com/cap/uranus/ariel.htm
This image of Ariel is a a composite of four clear filter images taken by the Voyager 2 spacecraft on January 24, 1986, from a distance of 130,000 kilometers. Two of these images that covered the terminator on the right were smeared because of the longer exposure times. The color is based upon lower resolution color images.
Much of Ariel's surface is densely pitted with craters 5 to 10 kilometers across. These craters are close to the threshold of detection in this picture. Numerous valleys and fault scarps crisscross the highly pitted terrain. Voyager scientists believe the valleys have formed over down-dropped fault blocks (graben); apparently, extensive faulting has occurred as a result of expansion and stretching of Ariel's crust. The largest fault valleys, near the terminator at right, as well as a smooth region near the center of this image, have been partly filled with deposits that are younger and less heavily cratered than the pitted terrain. Narrow, somewhat sinuous scarps and valleys have been formed, in turn, in these young deposits. It is not clear whether these sinuous features have been formed by faulting or by the flow of fluids.

(8) http://www.solarviews.com/cap/nep/triton.htm
Global color mosaic of Triton, taken in 1989 by Voyager 2 during its flyby of the Neptune system. Color was synthesized by combining high-resolution images taken through orange, violet, and ultraviolet filters; these images were displayed as red, green, and blue images and combined to create this color version. With a radius of 1,350, about 22% smaller than Earth's moon, Triton is by far the largest satellite of Neptune. It is one of only three objects in the Solar System known to have a nitrogen-dominated atmosphere (the others are Earth and Saturn's giant moon, Titan). Triton has the coldest surface known anywhere in the Solar System (38 K); it is so cold that most of Triton's nitrogen is condensed as frost, making it the only satellite in the Solar System known to have a surface made mainly of nitrogen ice. The pinkish deposits constitute a vast south polar cap believed to contain methane ice, which would have reacted under sunlight to form pink or red compounds. The dark streaks overlying these pink ices are believed to be an icy and perhaps carbonaceous dust deposited from huge geyser-like plumes, some of which were found to be active during the Voyager 2 flyby. The bluish-green band visible in this image extends all the way around Triton near the equator; it may consist of relatively fresh nitrogen frost deposits. The greenish areas includes what is called the cataloupe terrain, whose origin is unknown, and a set of 'cryovolcanic' landscapes apparently produced by icy-cold liquids (now frozen) erupted from Triton's interior.

(9) http://solarsystem.nasa.gov/planets/profile.cfm?Object=Neptune
This picture of Neptune was taken by Voyager 2 on August 20, 1989. One of the great cloud features, dubbed the Great Dark Spot by Voyager scientists, can be seen toward the center of the image. It is at a latitude of 22 degrees south and circuits Neptune every 18.3 hours. The bright clouds to the south and east of the Great Dark Spot constantly change their appearances in periods as short as four hours.

9) Komety a meziplanetární hmota



(1) http://www.eso.org/public/images/mc_naught55/
In this extraordinary picture taken from Paranal Observatory, the incomparable view offered by Comet C/2006 P1 (McNaught), which reached its perihelion in January 2007, unexpectedly becoming the brightest comet in the previous 40 years. The majestic comet, accompanied by the crescent Moon (on the right) is setting at twilight over the “sea of clouds” which typically covers the Pacific Ocean, only 12 km away from the observatory.

(2) http://hubblesite.org/newscenter/archive/releases/solar-system/comet/1994/33/
July 21, 1994: This Hubble telescope image of the giant planet Jupiter reveals the impact sites of two fragments from comet Shoemaker-Levy 9. Twenty-one large chunks of the comet rained down upon Jupiter in July 1994. The impact sites, located in the planet's Southern Hemisphere.

(3) http://hubblesite.org/newscenter/archive/releases/solar-system/comet/2006/18/
April 27, 2006: Hubble Space Telescope is providing astronomers with extraordinary views of Comet 73P/Schwassmann-Wachmann 3. The fragile comet is rapidly disintegrating as it approaches the Sun. Hubble images have uncovered many more fragments than have been reported by ground-based observers. These observations provide an unprecedented opportunity to study the demise of a comet nucleus. The comet is currently a chain of over three dozen separate fragments, named alphabetically, stretching across the sky by several times the angular diameter of the Moon. Hubble caught two of the fragments (B and G) shortly after large outbursts in activity. Hubble shows several dozen "mini-comets” trailing behind each main fragment, probably associated with the ejection of house-sized chunks of surface material. Deep-freeze relics of the early solar system, cometary nuclei are porous and fragile mixes of dust and ices that can break apart due to the thermal, gravitational, and dynamical stresses of approaching the Sun. Whether any of the many fragments survive the trip around the Sun remains to be seen in the weeks ahead.

(4) http://hubblesite.org/newscenter/archive/releases/solar%20system/comet/2007/40/image/c/
November 15, 2007: NASA's Hubble Space Telescope has probed the bright core of Comet 17P/Holmes, which, to the delight of sky watchers, mysteriously brightened by nearly a millionfold in a 24-hour period beginning Oct. 23, 2007. Astronomers used Hubble's powerful resolution to study Comet Holmes' core for clues about how the comet brightened. The orbiting observatory's Wide Field Planetary Camera 2 (WFPC2) monitored the comet for several days, snapping images on Oct. 29, Oct. 31, and Nov. 4. Hubble's crisp "eye" can see objects as small as 54 kilometers across, providing the sharpest view yet of the source of the spectacular brightening.

(5) http://www.nasa.gov/images/content/496690main_hartley-3-full_full.jpg
http://www.nasa.gov/mission_pages/epoxi/gallery-index.html
http://www.nasa.gov/mission_pages/epoxi/epoxi20101105.html
One of images taken by NASA's EPOXI mission spacecraft during its flyby of comet Hartley 2 on Nov. 4, 2010. During the encounter, the spacecraft and comet whisked past each other at a speed of 12.3 kilometers per second. The spacecraft came within about 700 kilometers of the comet's nucleus at the time of closest approach. The first image was taken at about 37 minutes before the time of closest approach at a distance of about 27,350 kilometers. The last image was taken 30 minutes after closest approach at a distance of 22,200 kilometers. The spacecraft was able to image nearly 50 percent of the comet's illuminated surface in detail. The EPOXI mission's flyby of comet Hartley 2 was only the fifth time in history that a comet nucleus has been imaged, and the first time in history that two comets have been imaged with the same instruments and same spatial resolution.

EPOXI is an extended mission that utilizes the already "in flight" Deep Impact spacecraft to explore distinct celestial targets of opportunity. The name EPOXI itself is a combination of the names for the two extended mission components: the extrasolar planet observations, called Extrasolar Planet Observations and Characterization (EPOCh), and the flyby of comet Hartley 2, called the Deep Impact Extended Investigation (DIXI). The spacecraft will continue to be referred to as "Deep Impact."

(6) http://www.solarviews.com/cap/pia/PIA14313.htm
NASA's Dawn spacecraft obtained this image with its framing camera on July 17, 2011. It was taken from a distance of about 15,000 kilometers away from the protoplanet Vesta. Each pixel in the image corresponds to roughly 1.4 kilometers.

(7) http://www.isas.jaxa.jp/e/snews/2005/1102.shtml
http://www.aldebaran.cz/bulletin/2005_45_haj.php
Hayabusa je japonská automatická sonda, které se podařilo odebrat vzorky z planetky Itokawa. Hayabusa je prvním tělesem, které odebralo vzorky z povrchu planetky a kterému se je podařilo dovézt zpět na Zemi. Sonda startovala v květnu 2003 a celou misi doprovázely časté problémy. K planetce sonda dolétla 12. září. Dne 4. listopadu 2005 se sonda přiblížila k povrchu planetky na několik set metrů. První pokus o přistání se konal 20. listopadu 2005. Sonda se dostala k planetce na vzdálenost menší jak 17 metrů, poté byl se sondou ztracen kontakt na celé tři hodiny, což způsobilo čidlo překážek, které sondu automaticky přepnulo do bezpečnostního režimu. Sonda podle záznamu některých přístrojů automaticky přistála na půl hodiny, ale nebyl aktivován odběr vzorků. Přistání s odebráním vzorků z povrchu se tak podařilo až na druhý pokus dne 26. listopadu. Pouzdro s odebranými vzorky z povrchu planetky přistálo v Austrálii 13. června 2010.

(8) http://www.nasa.gov/mission_pages/spitzer/multimedia/eros.html
http://neo.jpl.nasa.gov/missions/near.html

This image, taken by NASA's Near Earth Asteroid Rendezvous mission in 2000, shows a close-up view of Eros, an asteroid with an orbit that takes it somewhat close to Earth. NASA's Spitzer Space Telescope observed Eros and dozens of other near-Earth asteroids as part of an ongoing survey to study their sizes and compositions using infrared light.

Near-Earth Asteroid Rendezvous (NEAR): Launched on Feb. 17, 1996 the NEAR spacecraft made successful flybys of asteroid 243 Mathilde on June 27, 1997 and asteroid 433 Eros on December 23, 1998. The spacecraft then returned to asteroid Eros and on February 14, 2000 the spacecraft went int o orbit around Eros. Beginning with an orbit of about 320 x 366 km above Eros, a series of maneuvers put the spacecraft in lower and lower orbits and during the summer of 2000, the spacecraft spent several weeks in a near circular orbit of only 35 km from the center of Eros in 2000 and 2001.

Although the NEAR spacecraft was originally scheduled to rendezvous and orbit asteroid Eros in mid-January 1999, a scheduled main engine firing on December 20, 1998 failed to take place. As a result, the spacecraft flew past Eros at 4,100 km on December 23, 1998 at a relative velocity of about one kilometer per second. However, a successful main engine firing on January 3, 1999 allowed the spacecraft to catch up with Eros in mid-February 2000. The spacecraft was built by the Johns Hopkins University's Applied Physics Laboratory. The images of asteroid Mathilde taken by the NEAR spacecraft show 4-5 very large craters that were formed when other asteroids slammed into it long ago. Mathilde may have survived these collisions intact only because it seems to be a collection of rocky fragments (a rubble pile) rather than one monolithic rock. A rubble pile asteroid can more easily absorb the impact energy during a collision without breaking apart. By analogy, a bag of sand (rubble pile) can withstand a blow by a hammer but a solid, monolithic brick could not survive a blow of this type without shattering.

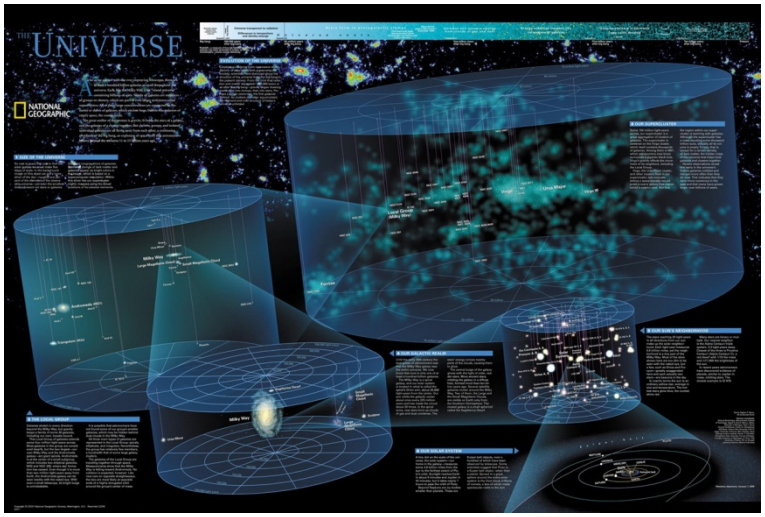
10) Sluneční soustava v Galaxii

(1) http://tzontonel.files.wordpress.com/2008/12/national-geographic-milky-way-reference-map1.jpg

(2) http://photojournal.jpl.nasa.gov/catalog/PIA00451
Snad nejznámější „rodinný portrét“ sluneční soustavy pořízený 14. února 1990 sondou Voyager 1. ze vzdálenosti 6,4 miliard kilometrů (43 astronomických jednotek a 32° nad rovinou ekliptiky. Snímek je seskládán z 60 políček a jde o obraz, který byl pořízen z největší vzdálenosti, do níž se dosud podařilo kameru vyslat. Voyager je dvojice sond NASA, která startovala v roce 1977 pomocí nosných raket Titan/Centaur. V roce 1979 proletěly obě sondy kolem Jupiteru, v roce 1980 (Voyager 1) a 1981 (Voyager 2) kolem Saturnu. Voyager 2 pokračoval dále k Uranu (1986) a Neptunu (1989). Obě sondy se zásadním způsobem zasloužily o poznání sluneční soustavy a dnes jsou nejvzdálenějšími objekty, které lidé vystřelili do vesmíru.

(3) Hvězdy, planety, magnety – Petr Kulhánek, Jakub Rozehnal, Ivan Havlíček, MF 2007.
Mezi pozůstatky raných období řadíme také tělesa Kuiperova pásu, který se rozkládá za drahou Neptunu až do vzdálenosti 1 000 AU. Je tvořen zejména planetezimálami, které se již kvůli malé hustotě materiálu nemohly spojit do větších celků. Jejich původně kruhové dráhy byly silně excentrizovány gravitačními interakcemi v období, kdy těmito oblastmi procházely planety Uran a Neptun. Kuiperův pás je zdrojem krátkoperiodických komet. Celková hmotnost Oortova oblaku není stabilní – s časem klesá. Je to určitá analogie „poločasu rozpadu“, která u Oortova oblaku činí asi 3 miliardy let. Za tuto dobu klesne celková hmotnost kometárních jader na polovinu, a to díky ztrátě hmotnosti při poutích sluneční soustavou, při pádech do Slunce a také při gravitačním působení okolních hvězd, jež mohou způsobit únik těles do mezihvězdného prostoru. A konečně je osud Oortova oblaku zpečetěn tím, že v závěrečných fázích hvězdného vývoje Slunce ztratí více než čtvrtinu své současné hmotnosti; to odsune kometární jádra téměř do dvojnásobné vzdálenosti, odkud budou časem rozprášena gravitací okolních hvězd.

11) Velkorozměrový vesmír



(1) http://tzontonel.files.wordpress.com/2008/12/national-geographic-universe-reference-map1.jpg

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