Face	Title	Description	Image URL
Suit - People (Hearts)			
A	Edwin Powell Hubble	(November 20, 1889 – September 28, 1953) was an American astronomer. He played a crucial role in establishing the fields of extragalactic astronomy and observational cosmology and is regarded as one of the most important astronomers of all time.	edwin_hubble
K	Konstantin Eduardovich Tsiolkovsky	(17 September 1857 – 19 September 1935) was a Russian and Soviet rocket scientist and pioneer of the astronautic theory. Published in 1923 "The Rocket into Planetary Space", which mentioned how a telescope could be propelled into Earth orbit by a rocket.	konstantin_tsiolkovsky
Q	Lyman Strong Spitzer	(June 26, 1914 – March 31, 1997) was an American theoretical physicist, astronomer and mountaineer. In 1946 published "Astronomical advantages of an extraterrestrial observatory" where he discussed the two main advantages that a space-based observatory.	lyman_spitzer
J	Michael Douglas Griffin	Is an American physicist and aerospace engineer who is the current Under Secretary of Defense for Research and Engineering. After spirited public discussion, approved the fifth servicing mission, completed in 2009.	michael_griffin
10	Robert Hutchings Goddard	(October 5, 1882 – August 10, 1945) was an American engineer, professor, physicist, and inventor who is credited with creating and building the world's first liquid-fueled rocket. Goddard successfully launched his model on March 16, 1926, ushering in an era of space flight and innovation. He and his team launched 34 rockets between 1926 and 1941.	robert_goddard
9	Randy Kimble	Was a project scientist for the Hubble Space Telescope Development Project at NASA's Goddard Space Flight Center. Currently serves as the Integration and Test Project Scientist for the James Webb Space Telescope.	randy_kimble
8	Michael Timothy "Bueno" Good	Is a NASA astronaut and retired commissioned officer in the United States Air Force, holding the rank of Colonel. Mike Good flew aboard Space Shuttle Atlantis for its STS-125 mission. STS-125 was the final Hubble Space Telescope servicing mission.	michael_good
7	Franklin Story Musgrave	Is an American physician and a retired NASA astronaut. He was a member of the first Hubble Space Telescope (HST) servicing and repair mission. In 1996 he became only the second astronaut to fly on six spaceflights, and he is the most formally educated astronaut with six academic degrees.	story_mugslave
6	Jeffrey Alan Hoffman	Is an American former NASA astronaut and currently a professor of aeronautics and astronautics at MIT. Hoffman made five flights as a space shuttle astronaut, including the first mission to repair the Hubble Space Telescope in 1993, when the orbiting telescope's flawed optical system was corrected.	jeffrey_hoffman

Face	Title	Description	Image URL
5	Riccardo Giacconi	Is an Italian-American Nobel Prize-winning astrophysicist who laid the foundations of X-ray astronomy. As the first director of STScI, Riccardo Giacconi, announced in 1986 that he intended to devote some of his director discretionary time to allowing amateur astronomers to use the telescope. The total time to be allocated was only a few hours per cycle but excited great interest among amateur astronomers.	riccardo_giacconi
4	Patrick Crouse	Is the project manager for the Hubble Space Telescope mission at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Crouse accepted this position in 2010 and has overall responsibility for all technical, budgetary and administrative aspects of one of NASA's flagship missions.	patrick_crouse
3	Kathryn Ryan Cordell Thornton	Is an American scientist and a former NASA astronaut with over 975 hours in space, including 21 hours of extravehicular activity. Was a mission specialist EVA crew member aboard the Space Shuttle Endeavour on the STS-61 Hubble Space Telescope (HST) servicing and repair mission.	kathryn_thornton
2	The Hubble Team	The Hubble's 25th anniversary of flight. Since Hubble's official start in 1977, thousand of people from the United States and Europe have supported the mission through building and testing hardware and software, operating the vehicle, and performing science operations. More than 30 astronauts have flown to Hubble to deploy, upgrade and repair the observatory with the support of a human spaceflight and space shuttle staff.	hubble_team
Suit - Instruments (Clubs)			
A	Advanced Camera for Surveys	(ACS; 2002–present) is a third-generation axial instrument aboard the Hubble Space Telescope (HST). The initial design and scientific capabilities of ACS were defined by a team based at Johns Hopkins University.	acs
K	Cosmic Origins Spectrograph	(COS; 2009–present) is a science instrument that was installed on the Hubble Space Telescope during Servicing Mission 4 (STS-125) in May 2009. It is designed for ultraviolet (90–320 nm) spectroscopy of faint point sources with a resolving power of ≈1,550–24,000.	cos
Q	Corrective Optics Space Telescope Axial Replacement	(COSTAR; 1993–2009) is the instrument designed to correct Hubble Space Telescope's spherical aberration for light focused at the FOC, FOS and GHRS instruments. Built by Ball Aerospace Corp., it replaced the High Speed Photometer (HSP) during the first Hubble Servicing Mission in 1993.	costar
J	Faint Object Camera	(FOC; 1990–2002) was a camera installed on the Hubble Space Telescope from launch in 1990 until 2002. It was replaced by the Advanced Camera for Surveys. In December 1993, Hubble's vision was corrected on STS-61 by installing COSTARS, which corrected the problem with Hubble's mirror before it reached an instrument like FOC.	foc
10	Faint Object Spectrograph	[10] Faint Object Spectrograph (FOS; 1990–1997) was a spectrograph installed on the Hubble Space Telescope. It was replaced by the Space Telescope Imaging Spectrograph in 1997, and is now on display in the National Air and Space Museum in Washington DC.	fos

Face	Title	Description	Image URL
9	Fine Guidance Sensor	(FGS; 1990–present) is an instrument on board a space telescope that provides high-precision pointing information as input to the observatory's attitude control systems.	fgs
8	Goddard High Resolution Spectrograph	(GHRS/HRS; 1990–1997) was an ultraviolet spectrograph installed on the Hubble Space Telescope during its original construction, and it was launched into space as part of that space telescope aboard the Space Shuttle on April 24, 1990 (STS-31). The instrument is named after 20th century rocket pioneer Robert H. Goddard.	ghrs
7	High Speed Photometer	(HSP; 1990–1993) is a scientific instrument installed on the Hubble Space Telescope. The HSP was designed to measure the brightness and polarity of rapidly varying celestial objects. It could observe in ultraviolet, visible light, and near infrared at a rate of one measurement per 10 microseconds.	hsp
6	Near Infrared Camera and Multi-Object Spectrometer	(NICMOS; 1997–present, hibernating since 2008) is a scientific instrument for infrared astronomy, installed on the Hubble Space Telescope (HST), operating from 1997 to 1999, and from 2002 to 2008. Images produced by NICMOS contain data from the near-infrared part of the light spectrum.	nicmos
5	Space Telescope Imaging Spectrograph	(STIS; 1997–present (non-operative 2004–2009)) is a spectrograph, also with a camera mode, installed on the Hubble Space Telescope. Aerospace engineer Bruce Woodgate of the Goddard Space Flight Center was the principal investigator and creator of the STIS. It operated continuously from 1997 until a power supply failure in August 2004.	stis
4	Wide Field and Planetary Camera	(WFPC; 1990–1993) was a camera installed on the Hubble Space Telescope until December 1993. It was one of the instruments on Hubble at launch, but its functionality was severely impaired by the defects of the main mirror optics which afflicted the telescope.	wfpc
3	Wide Field and Planetary Camera 2	(WFPC2; 1993–2009) is a camera formerly installed on the Hubble Space Telescope. The camera was built by the Jet Propulsion Laboratory and is roughly the size of a baby grand piano. It was installed by servicing mission 1 (STS-61) in 1993, replacing the telescope's original Wide Field and Planetary Camera (WF/PC).	wfpc2
2	Wide Field Camera 3	(WFC3; 2009–present) is the Hubble Space Telescope's last and most technologically advanced instrument to take images in the visible spectrum. It was installed as a replacement for the Wide Field and Planetary Camera 2 during the first spacewalk of Space Shuttle mission STS-125 on May 14, 2009.	wfc3
Suit - Discoveries (Dimonds)			
A	Hubble Deep Field	No telescope before Hubble had the resolution to see these distant galaxies, astronomers turned Hubble on what appeared to be a nearly empty patch of sky and let it soak up all the light it could for 10 days. Results turned up a treasure trove: 3,000 galaxies, large and small, shapely and amorphous, burning in the depths of space. The stunning image was called the Hubble Deep Field.	hubble_deep_field

Face	Title	Description	Image URL
K	NGC 4603	Before Hubble, astronomers had only been able to narrow the universe's age down to 10-20 billion years old – not a particularly exact measurement with 10 billion years of leeway. Hubble performed the definitive study of 31 Cepheid variable stars, helping to determine the current expansion rate and thereby narrow the age of the universe down to the most accurate it's ever been. Its observations of Cepheid variable stars in galaxies like NGC 4603.	ngc_4603
Q	Black Holes	Hubble observations also helped determine that these brilliant galactic centers are powered by giant black holes. As matter falls into a supermassive black hole, the surrounding region heats up and releases tremendous amounts of energy and light, creating a quasar. Hubble found quasars in the centers of galaxies that are colliding or brushing up against one another, as well as in elliptical galaxies.	m87_jet
J	Dark Energy	Hubble's clear vision allowed astronomers to find extremely distant supernovae. But Hubble's observations threw the standard assumptions into disarray: the universe wasn't slowing down at all. Examining the properties of the supernovae Hubble had imaged, astronomers found that the universe was speeding up as though something were propelling it - dark energy.	sn1994g
10	The Birth of Stars and Planets	Before Hubble, astronomers could see the jets, but not the star-forming disks. Hubble's vision allowed them to see both. In 1995, it took the first detailedimages of jets and disks in the Orion Nebula.Hubble has since taken many imagesof jets, and found the first direct evidence that they originate at the centerof the dusty, gaseous disk the star is drawing on for its raw material.	carina_nebula
9	Extrasolar Planets	Hubble has made the first measurements of the composition of planets around other stars, finding atmospheres containing sodium, carbon and oxygen, and a planet with a comet-like tail of hydrogen evaporating into space. It also found the first organic molecule on an extrasolar planet: methane in the atmosphere of a Jupiter-sized planet blisteringly close to its star.	trappist_1b_1c
8	Comet Crashes	In May 2009, astronauts visited Hubble to install new instruments and make repairs. In July, while engineers and scientists were still in the process of testing and adjusting the refurbished telescope, an amateur astronomer discovered a strange dark spot bruising Jupiter's surface. The gas giant had been struck again. An asteroid had streaked unnoticed into the planet, leaving an expanding impact site in its wake.	jupiter_comet_shoemal
7	Gamma Ray Bursts	Hubble observations have helped discover that a large proportion of gamma ray bursts originate in the brightest star-forming regions that also have stars low in metal content. It appears that the process of creating a supernova from a star that contains lots of metal, and a star that contains little, may be different.	gamma_ray_burst
6	Tracing Galactic Histories	Hubble observed the Andromeda galaxy's halo, that region of stars on the outskirts of the galaxy, beyond the main galactic disk. Andromeda is the closest galaxy to our Milky Way, and while it has been observed frequently from the ground, only Hubble has resolution powerful enough to see its individual stars.	andromeda_halo

Face	Title	Description	Image URL
5	Dying Stars	Today, Hubble has observed many of these nebulae and found a wide range of complicated and extraordinary shapes, from tunnels to interlocking rings. The Cat's Eye nebula, for example, consists of 11 bubbles of gas, each appearing from our perspective as a ring.	cat's_eye_nebula
4	Aerospace Engineering	As result from Hubble's long lifetime on orbit, extensive instrumentation, and return of assemblies to the Earth where they can be studied in detail. In particular, Hubble has contributed to studies of the behavior of graphite composite structures in vacuum, optical contamination from residual gas and human servicing, radiation damage to electronics and sensors, and the long term behavior of multi-layer insulation.	multi_layer_insulation
3	Saturn Aurora	Saturn's tilt caused its North Pole to be clearly visible from Earth. The featured image is a composite of ultraviolet images of aurora and optical images of Saturn's clouds and rings, all taken recently by Hubble. Like on Earth, Saturn's northern auroras can make total or partial rings around the pole.	saturn_aurora
2	Farthest Known Galaxy	On March 3, 2016, researchers using Hubble data announced the discovery of the farthest known galaxy to date: GN-z11. The Hubble observations occurred on February 11, 2015, and April 3, 2015, as part of the CANDELS/GOODS-North surveys.	gn_z11
		Suit - Facts (Spades)	
A	Mission	Launch: April 24, 1990, from space shuttle Discovery (STS-31) Deployment: April 25, 1990 First Image: May 20, 1990: Star cluster NGC 3532 Servicing Mission 1 (STS-61): December 1993 Servicing Mission 2 (STS-82): February 1997 Servicing Mission 3A (STS-103): December 1999 Servicing Mission 3B (STS-109): February 2002 Servicing Mission 4 (STS-125): May 2009	discovery_hubble_laun
K	Size	Length: 43.5 feet (13.2 m) Weight: At Launch: about 24,000 pounds (10,886 kg) Post SM4: about 27,000 pounds (12,247 kg) Maximum Diameter: 14 feet (4.2 m)	hubble_deployed
Q	Spaceflight Statistics	Low Earth Orbit: Altitude of 340 miles (295 nautical miles, or 547 km), inclined 28.5 degrees to the equator Time to Complete One Orbit: about 95 minutes Speed: about 17,000 mph (27,300 kph)	orbit
J	Optical Capabilities	Sensitivity to Light: Ultraviolet through Infrared (115–2500 nanometers)	carina_nebula
10	Hubble's Mirrors	Primary Mirror Diameter: 94.5 inches (2.4 m) Primary Mirror Weight: 1,825 pounds (828 kg) Secondary Mirror Diameter: 12 inches (0.3 m) Secondary Mirror Weight: 27.4 pounds (12.3 kg)	mirror
9	Pointing Accuracy	In order to take images of distant, faint objects, Hubble must be extremely steady and accurate. The telescope is able to lock onto a target without deviating more than 7/1000th of an arcsecond, or about the width of a human hair seen at a distance of 1 mile.	pillars_of_creation
8	Data Statistics	Hubble transmits about 150 gigabits of raw science data every week it is about 10 terabytes of new data per year. The total archive is currently over 150 TB insize.	kennedy_space_center

Face	Title	Description	Image URL
7	Power Needs	Energy Source: The Sun Mechanism: Two 25-foot solar panels Power Generation (in Sunlight): about 5,500 watts Power Usage (Average): about 2,100 watts	solar_panels
6	Power Storage	Batteries: 6 nickel-hydrogen (NiH) Storage Capacity: Equal to about 22 average car batteries	power_cells
5	Science	Astronomers using Hubble data have published more than 15,000 scientific papers, making it one of the most productive scientific instruments ever built. Thosepapers have been cited in other papers 738,000 times.	alpha_centauri_a_b
4	Mobility	Hubble has no thrusters. To change angles, it uses Newton's third law by spinning its wheels in the opposite direction. It turns at about the speed of a minutehand on a clock, taking 15 minutes to turn 90 degrees.	no_thrusters
3	Weight	Hubble weighed about 24,000 pounds at launch but if returned to Earth today would weigh about 27,000 pounds — on the order of two full-grown African elephants.	on_shuttle
2	Primary Mirror	Hubble's primary mirror is 2.4 meters (7 feet, 10.5 inches) across. It was so finely polished that if you scaled it to be the diameter of the Earth, you wouldnot find a bump more than 6 inches tall.	primary_mirror