Why can't the hubble telescope show us the landing site on the moon and left behind equipment?

Answer

The Hubble Space Telescope (HST) is not well-suited for observing the Moon's surface or human-made objects on it for several reasons:

1. **Resolution Limitations:**
   - Hubble's best resolution is about 0.05 arcseconds. While this is exceptional for observing distant galaxies or stars, it translates to roughly 100 meters per pixel at the distance of the Moon. This means that the small-scale features like the Apollo landing sites, which are less than 100 meters in scale, would not be resolved well enough to be distinguishable from the surrounding lunar terrain.
2. **Proximity of the Moon:**
   - The Moon is relatively close to Earth compared to the vast distances Hubble typically observes. Hubble is designed to look at objects far beyond our solar system, where its resolution is more effectively utilized. Objects that are too close risk "Earth glare" or other light interference, which can make observing them difficult.
3. **Field of View and Exposure:**
   - Even if Hubble could resolve details on the Moon, the field of view it captures in a single image is not optimized for such close objects. To image the Moon, you would need to take many small images and stitch them together, which isn't practical for Hubble's observational strategy.
4. **Contrast and Brightness:**
   - The Moon is very bright compared to the deep space objects Hubble is designed to observe. This brightness can saturate Hubble's sensors, making it hard to get useful data from the surface. Also, the contrast between the bright lunar surface and any artifacts left by humans would be challenging to capture clearly.
5. **Purpose of Hubble:**
   - Hubble was designed to study the universe beyond our solar system, not to look at planetary surfaces or nearby celestial bodies. Its instruments are optimized for different wavelengths and sensitivities than what would be needed to observe small objects on the Moon.

For observing the Apollo landing sites or other lunar surface features:

- **Lunar Reconnaissance Orbiter (LRO):** NASA's LRO, launched in 2009, has been specifically tasked with mapping the Moon. Its camera, the Lunar Reconnaissance Orbiter Camera (LROC), can take images with resolutions down to 50 cm/pixel, far better than Hubble can achieve from Earth orbit. LRO has indeed imaged the Apollo landing sites, showing the descent stages of the lunar modules, tracks made by the astronauts, and even some of the equipment they left behind.
- **Other Spacecraft:** Missions like Japan's SELENE (Kaguya) have also observed the lunar surface in detail, although not specifically to look at the Apollo sites.
- **Future Missions:** Upcoming missions might include even more advanced imaging technology, potentially providing even clearer views of human artifacts on the Moon.

While Hubble has revolutionized our understanding of the universe, its capabilities are not aligned with detailed lunar surface imaging, especially not for small, human-made objects like the Apollo landing sites.