

The Space Age



"We shall not cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time."

- T. S. Eliot

The Space Age (1957-)

• the space age began long *before the iPhone...*

• *colour TV's* were rare...

• ... and *phones & computers* were...



Early 'Firsts'

- satellite: *Sputnik I* (1957)
- man in orbit: *Y. Gagarin* (1961)
- woman: *V. Tereskova* (1963)
- spacewalk: *A. Leonov* (1965)
- lunar landing: *Luna 9* (1966)




Q: Notice anything?

Mercury (1959-1963)

- used *Redstone, Atlas* rockets
- held *single astronaut*
- *The Mercury 7*, all *Air Force test pilots* (eg) "*The Right Stuff*"
- *first American in space: A. Shephard* (1961)
- *first American to orbit: J. Glenn* (1962)







Gemini (1965-1966)

- 12 **orbital** flights using **Titan II**
- held **two astronauts** ("**Gemini**")

Q: Why do Project Gemini?

- first **long duration flight** (1965)
- first **US spacewalk** (1965)
- first **orbital docking** (1966)


Kennedy & The Moon


- famous speech to joint session of congress (1961)

JFK: "I believe this nation should commit itself... before this decade is out... of landing a man on the Moon and returning him safely to the Earth."

Q: What were the motivations to do this?


Q: Why did some people think JFK was crazy?

- **none** of the required technology existed
- only weeks since first American **suborbital flight**
- **cost** of entire program would be **\$25 billion**



Apollo (1969-1972)

- 3 man crew
- **Command/Service Module (CSM)**
- **Lunar Module (LM)**
- **Apollo 8,10 circled Moon; Apollo 9 tested LM**
- **Apollo 11, 12, 14-17 landed** on the Moon



The Saturn V Rocket

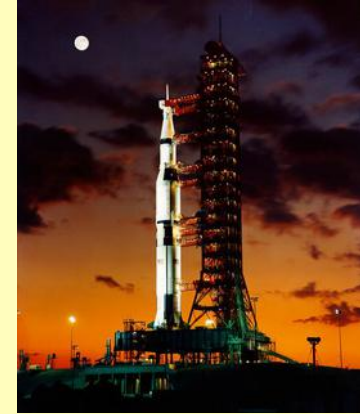
- designed by **Wernher von Braun**
- most **powerful** rocket **ever** built
- **1st stage thrust:** 7.5 million lbs

(eg) equivalent “horsepower”
to ~ **half million** sports cars

- **110m high!!**

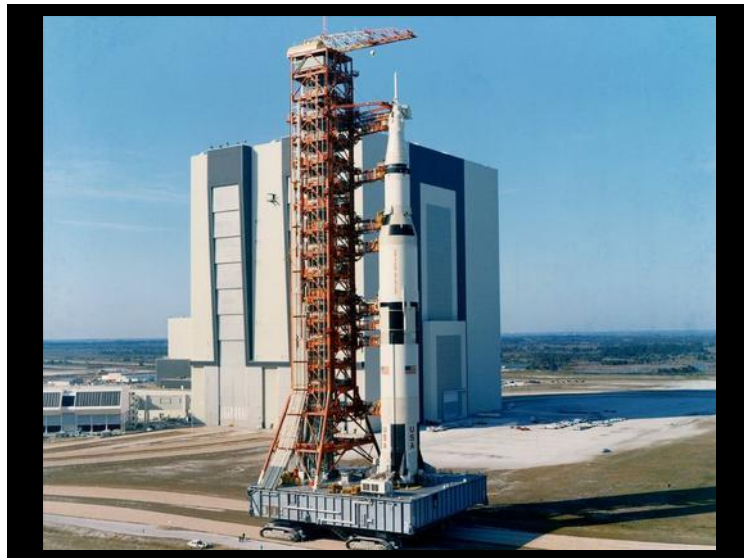
Q: Why did the rocket have to
be so big and powerful?

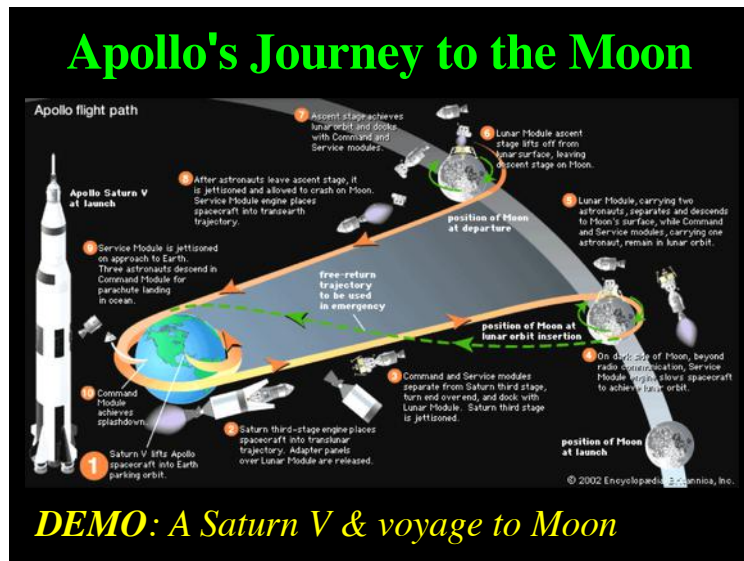
- need to **escape Earth's** gravity
& send spacecraft to the **Moon**



- **Saturn V** consisted of **three stages** - Why?

(eg) competing Soviet **N-1** never successfully flew





CLICKER: What part(s) of Apollo return to Earth?

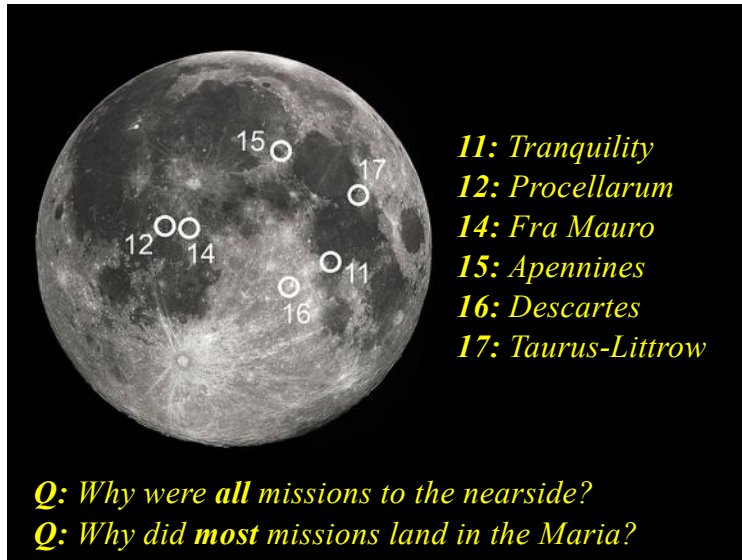
- the Command/Service Module**
- CSM and the Lunar Module**
- only the Command Module**
- the entire rocket**



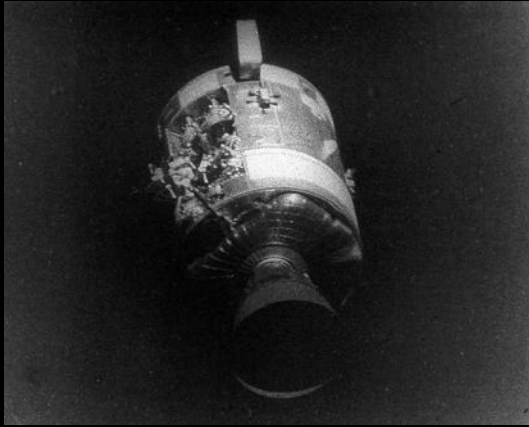
Walking on the Moon

Apollo 11, July 20, 1969

- **12 astronauts** have walked on the Moon
- **Neil Armstrong & “Buzz” Aldrin** were **first**

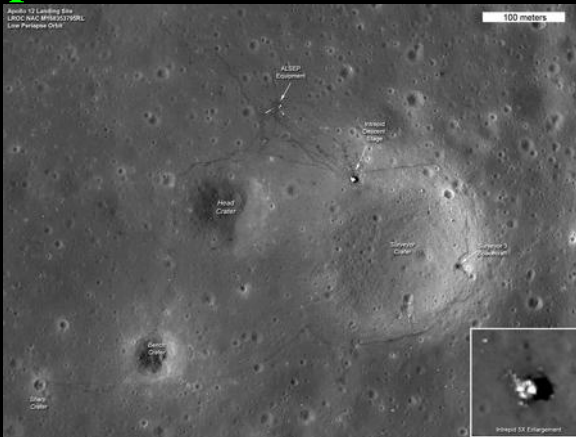


“Lucky” Apollo 13 (1970)



• *Apollo 12 lands 200 m from Surveyor 3*

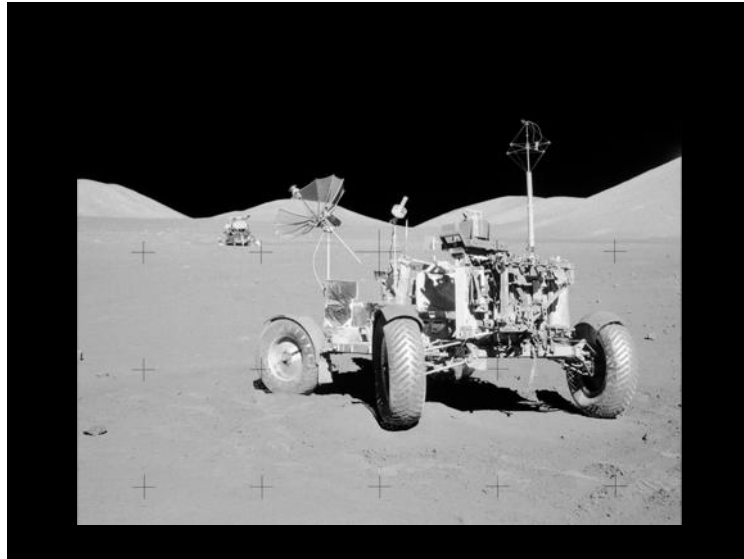
Apollo 12 (Oceanus Procellarum)



• *from LRO (2010), ~ 30 km above surface*



• *only one scientist made it to the Moon*
• *Harrison "Jack" Schmitt (Apollo 17)*

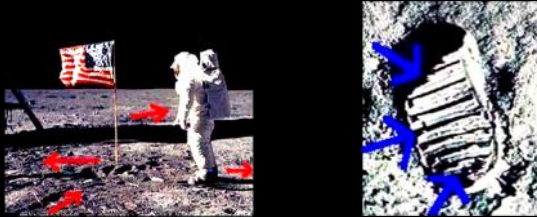


CLICKER: Do you accept that humans went to the Moon ~50 years ago (ie. NASA's Apollo)?

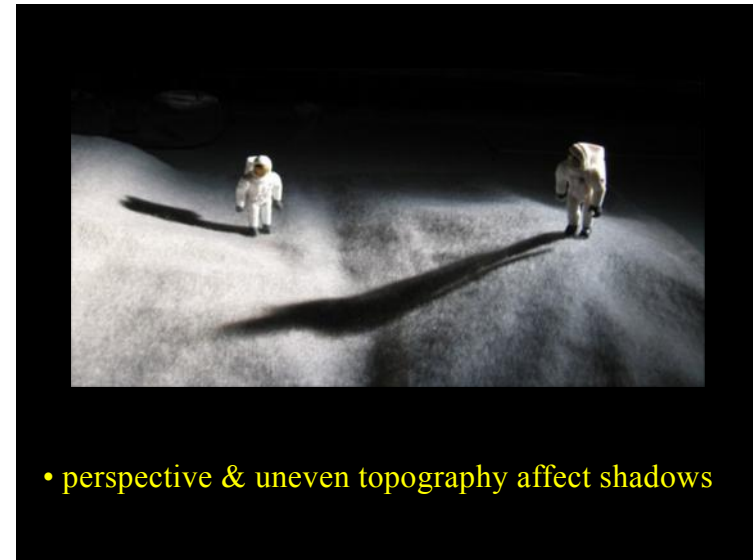
- (a) *absolutely!*
- (b) *pretty sure*
- (c) *undecided*
- (d) *it's a hoax*

The Moon Landing "Hoax"

- believe in *Antarctica?* *Columbus?* *satellites?*



- Aldrin & flag: *lighting/shadows*
- footprint: *lighting/shadows* and *depth*

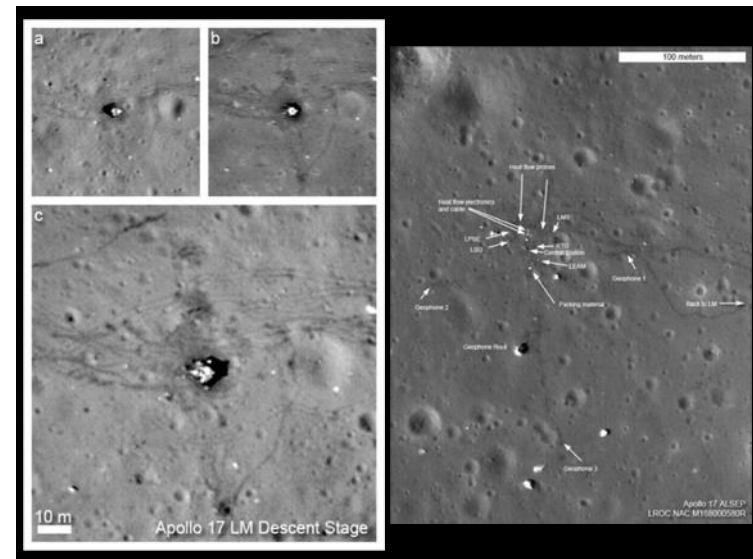


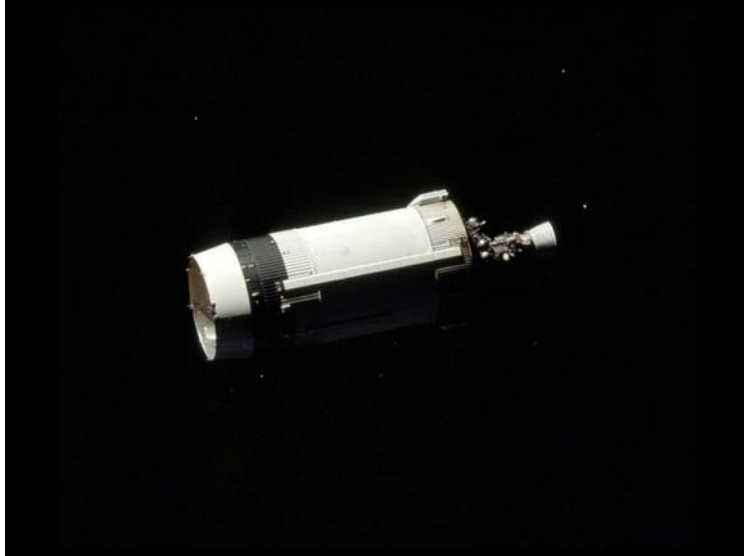
- perspective & uneven topography affect shadows

Apollo 17 LM "Challenger" in Taurus-Littrow



- *from command module, 100 km up*



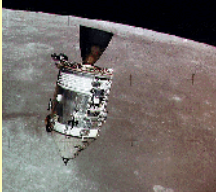


CLICKER: Would you accept a job as an astronaut (if NASA offered)?

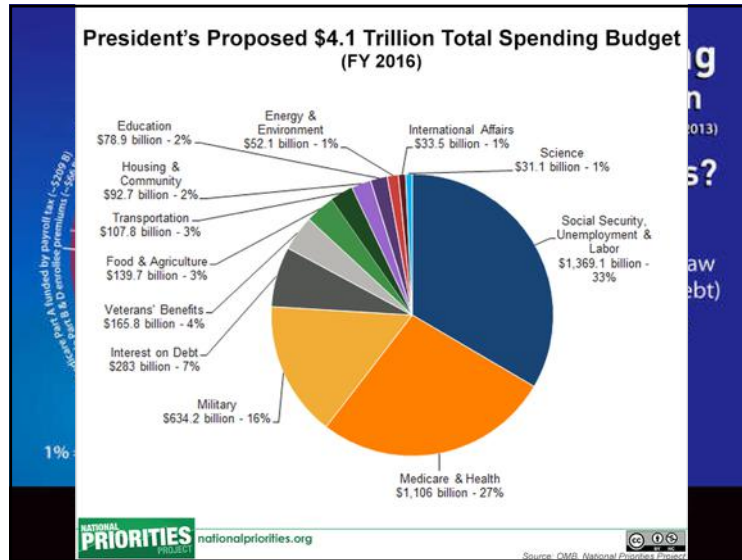
- (a) in a heartbeat!
- (b) no way!
- (c) maybe... depends on where they send me

Return to the Moon?

- plans by **US, China** for manned (lunar) missions
- ~ **\$100 billion** price tag




- **US election** (2016) ~ **\$6.5 billion**
- **US budget** (2016) ~ **\$4.1 trillion**
- **US military budget** (2016) ~ **\$634 billion**



Review: Space Age

- **Russians** dominated early space race “firsts”
- **Americans** used a “staged” approach to manned spaceflight: **Mercury, Gemini & Apollo**
- **Saturn V** was crucial to success of moon missions
- **12 astronauts** have walked on the Moon but **despite** this some still think **Apollo** was a “hoax”