



---

---

---

---

---

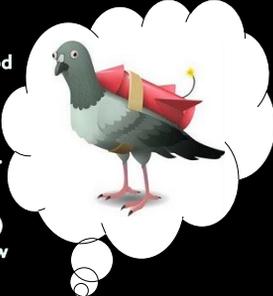
---

---

---

### The first rocket was what???

- A Greek named Archytas mystified citizens in Italy by flying a pigeon made of wood in 400B.C.
- Escaping steam propelled the bird suspended on wires.
- Used the action-reaction principle, (Newton's 3<sup>rd</sup> Law) which was not a scientific law until the 17th century.



---

---

---

---

---

---

---

---

### The First True Rockets

- The first true use of rockets reportedly happened in 1232
- The Chinese had a simple gunpowder used to create explosions during religious festivals
- Filled bamboo tubes with the powder, and threw them into fires



---

---

---

---

---

---

---

---

-Discovered tubes could launch themselves just by the power produced from the escaping gas.

-Used during the battle of Kai-Keng, to repel Mongol invaders with a barrage of "arrows of flying fire."

-These fire-arrows were a simple form of a solid-propellant rocket.



---

---

---

---

---

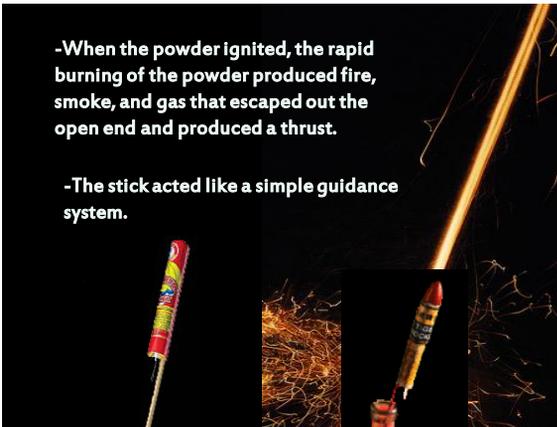
---

---

---

-When the powder ignited, the rapid burning of the powder produced fire, smoke, and gas that escaped out the open end and produced a thrust.

-The stick acted like a simple guidance system.



---

---

---

---

---

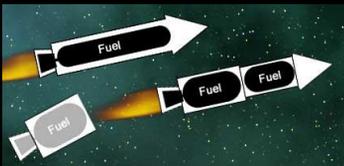
---

---

---

-By the 16th century, rockets were no longer used for war, though they were still used for fireworks displays

-German fireworks maker, Johann Schmidlap, invented the "step rocket"



-A large rocket (first stage) carried a smaller rocket (second stage). When the large rocket burned out, the smaller one continued to a higher altitude before showering the sky with glowing cylinders.

---

---

---

---

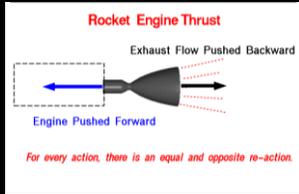
---

---

---

---

-During the 17th century, Sir Isaac Newton organized his understanding of physical motion into three scientific laws.



-The laws explain how rockets work and why they are able to work in the vacuum of outer space.

---

---

---

---

---

---

---

---

"The Earth is the cradle of the mind, but we cannot live forever in a cradle". - (Konstantin Tsiolkovsky-Kaluga, 1911. From a letter.)



---

---

---

---

---

---

---

---

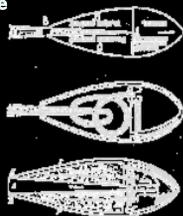
### Rockets used for space travel

- In 1898, a Russian physicist, Konstantin Tsiolkovsky, proposed the idea of space exploration by rocket.

-Tsiolkovsky published ideas about using multistage rockets

-He suggested that rockets could travel outside the Earth's atmosphere

-Tsiolkovsky also suggested the use of liquid propellants for rockets



Tsiolkovsky Rocket Designs

---

---

---

---

---

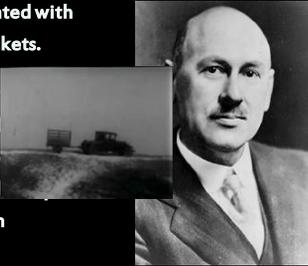
---

---

---

## Robert H. Goddard (1882-1945)

- Goddard experimented with solid-propellant rockets.
- Became convinced that rockets could be propelled by liquid fuel. Goddard achieved a successful flight with a liquid propellant rocket on March 16, 1926.




---

---

---

---

---

---

---

---

- The 1926 Rocket was 10 pounds and was launched from a cabbage patch in Auburn, Massachusetts.
- It flew for only 2.5 seconds, climbed 12.5 meters, and landed 56 meters away.
- This was the spark of the Saturn V rocket which would take humans to the moon.

This is the frame from which it was fired on March 16, 1926




---

---

---

---

---

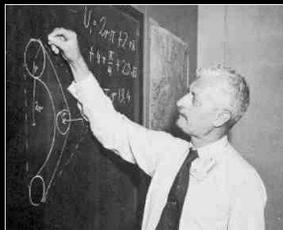
---

---

---

## Hermann Oberth (1894-1989)

- Developed mathematical theories of rocket flight and theorized about effects of spaceflight on humans.
- First introduced idea of an electric "Moon Car".
- Introduced concept of Space Station where rockets could be refueled.




---

---

---

---

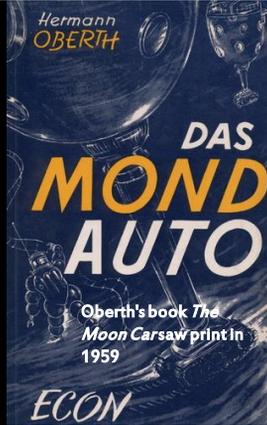
---

---

---

---

- Oberth also popularized the concept of spaceflight through books.
- Oberth's vision inspired young German rocketeers to establish the Society for Spaceship Travel (German acronym "VfR") in 1927.




---

---

---

---

---

---

---

---

### Wernher von Braun (1912-1977)

- Joined the VfR when he was 19
- In 1932 he went to work for the German army to develop ballistic missiles
- Developed into the V-2 (vengeance Weapon 2) for the German Army during WWII




---

---

---

---

---

---

---

---

- The V2 carried 2000 lbs. of explosives, traveled 3,000 MPH, and could reach heights of up to 50 miles
- First launched successfully on October of 1942
- In April of 1945 a V2 was being lost by the Germans, von Braun and 12 associates surrendered to the Allies, and came to work for the US government




---

---

---

---

---

---

---

---

- Became director of Marshall Space Flight Center in Huntsville, Alabama, and constructed a new long range ballistic missile called the Redstone.
- Moved to NASA in 1960
- Developed the Saturn V which would be used to launch manned spaceflights to the moon. It was 363 feet tall and weighed 3,000 tons.



---

---

---

---

---

---

---

---



and it would eventually launch astronauts into space.

---

---

---

---

---

---

---

---



Thanks to NASA for the information included in this presentation.  
[http://www.grc.nasa.gov/WWW/K-12/TRC/Rockets/history\\_of\\_rockets.html](http://www.grc.nasa.gov/WWW/K-12/TRC/Rockets/history_of_rockets.html)

---

---

---

---

---

---

---

---