

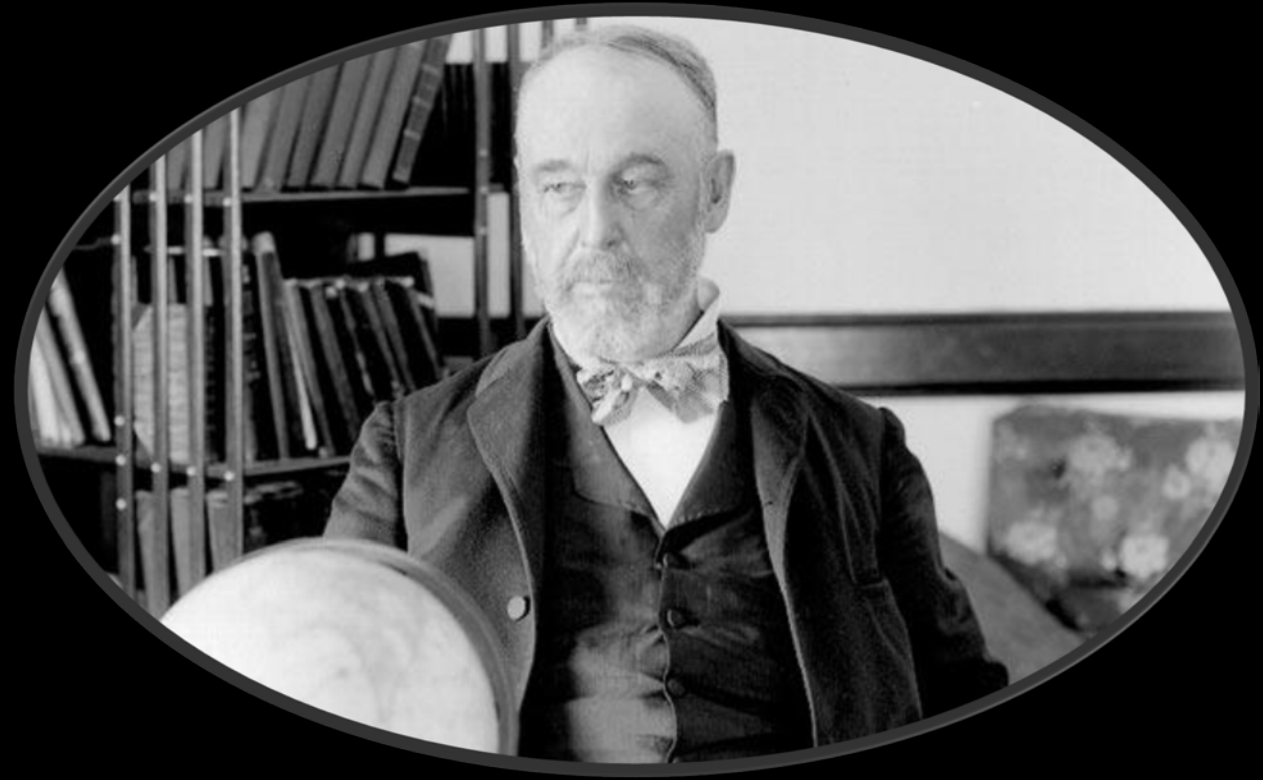
# MARS

DOES MARS HAVE MOONS?



# THE DISCOVERY OF MARS' MOONS

- Discovered by American astronomer Asaph Hall
  - First found Deimos August 12<sup>th</sup> 1877
  - then Phobos August 18<sup>th</sup> 1877



# GREEK NAMES

- Named after the mythological sons of Ares who was the Greek counterpart to Mars, the Roman God of War
  - Phobos means fear
  - Deimos means flight (as in: to flea, or run away)



Not to scale



# INTRODUCTION

- Diameter= 22km
- Orbit= 8 hours
- Distance from Mars= 9 376 km



**PHOBOS**

- Diameter= 13km
- Orbit= 30 hours
- Distance from Mars= 20 069 km



**DEIMOS**

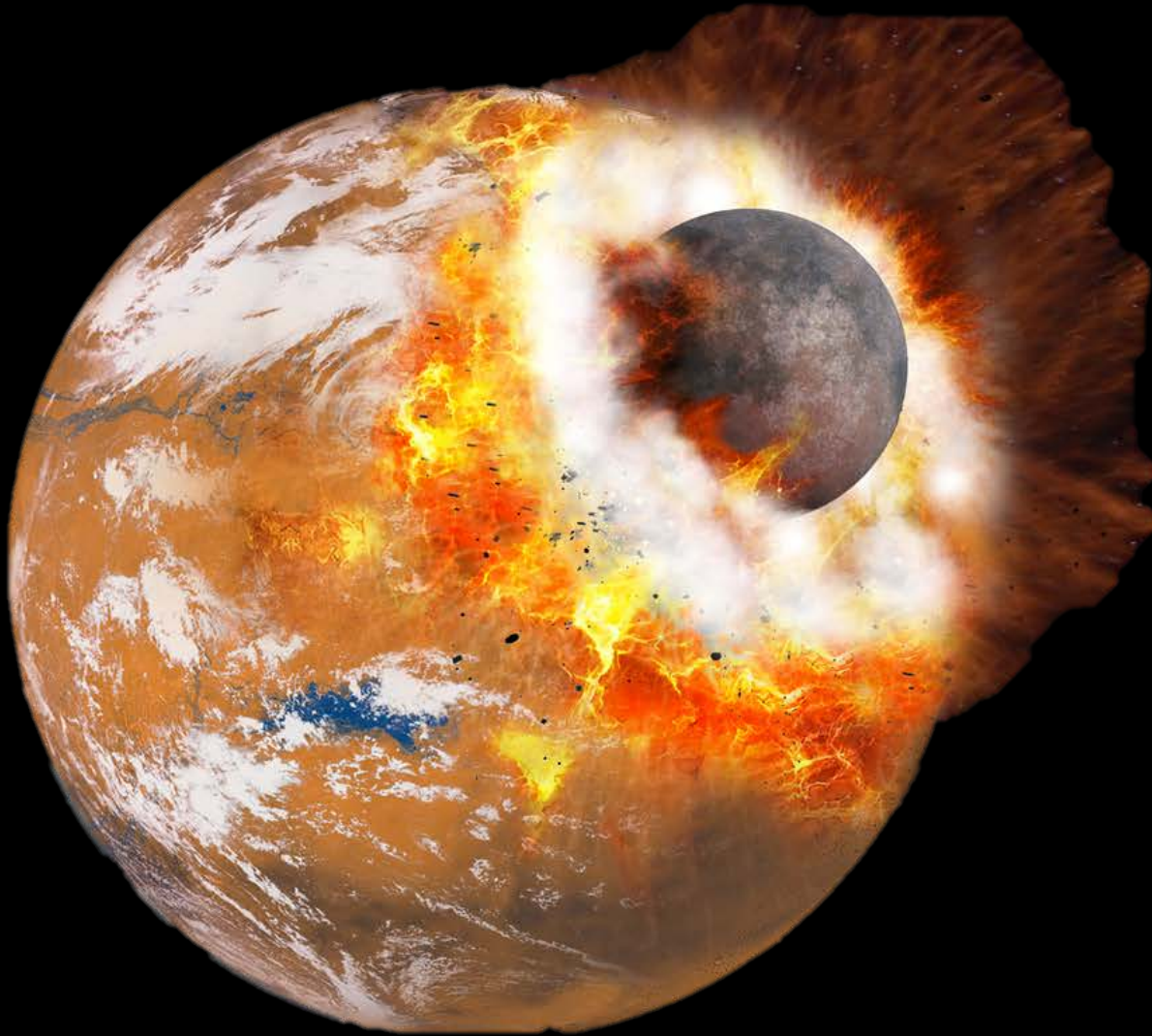


# COMPOSITION AND FEATURES

- Primarily carbon-rich rock
- Mixed with ice deposits
  - Similar composition to asteroids in outer asteroid belt of solar system
- Surfaces are covered in craters, dust and loose rock
- Smallest moons in solar system
  - Not large enough to become spherical
    - Look like space potatoes!



# FORMATION THEORIES



- 3 competing theories of formation:
  1. Asteroids were pulled into Mars' Orbit
  2. Asteroid crashed into Mars and material released came together to form moons
  3. Asteroid crashed into a once larger moon splitting it in two

# STARTING AS ASTEROIDS

This theory involves the capture of passing asteroids.







# FOR AND AGAINST THEORY

## SUPPORTING EVIDENCE

- Composition of moons is very similar to asteroids
- Atmosphere of early Mars could have settled the asteroids into more circular, controlled orbits
- Irregular shapes consistent with asteroids

## DISPROVING EVIDENCE

- Phobos and Deimos have very circular orbits, whereas captured bodies usually have elliptical orbits
- Atmosphere may not have been significant enough to change orbits





# VIOLENT BIRTH LIKE EARTH'S MOON

In this theory, it is believed that an asteroid impacted with Mars causing debris from the surface to be ejected from the planet. Once in space, the debris would have joined together to form Phobos and Deimos.



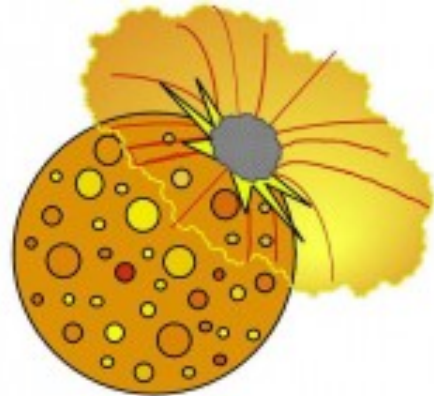
# FOR AND AGAINST THEORY

## SUPPORTING EVIDENCE

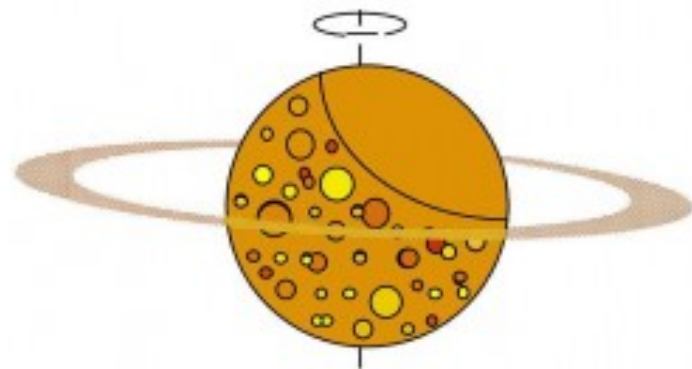
- Late Heavy Bombardment period of solar system led to many such collisions

## DISPROVING EVIDENCE

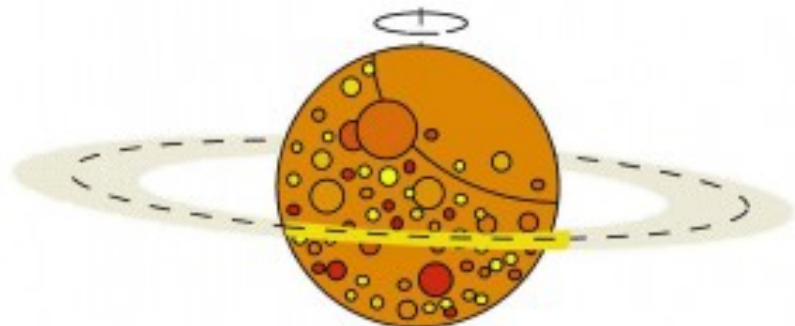
- Moons have seemingly different composition to Mars to be product of its debris (density of moons is much lower)



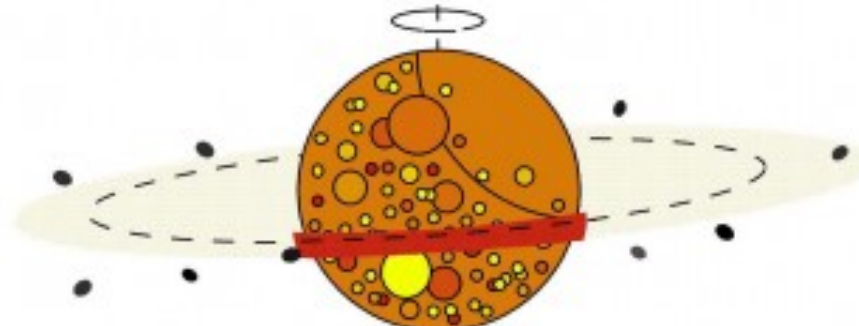
(a)



(b)



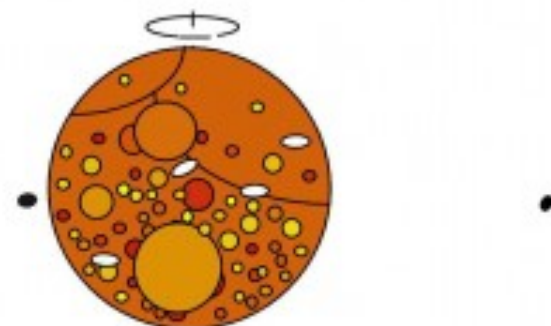
(c)



(d)



(e)

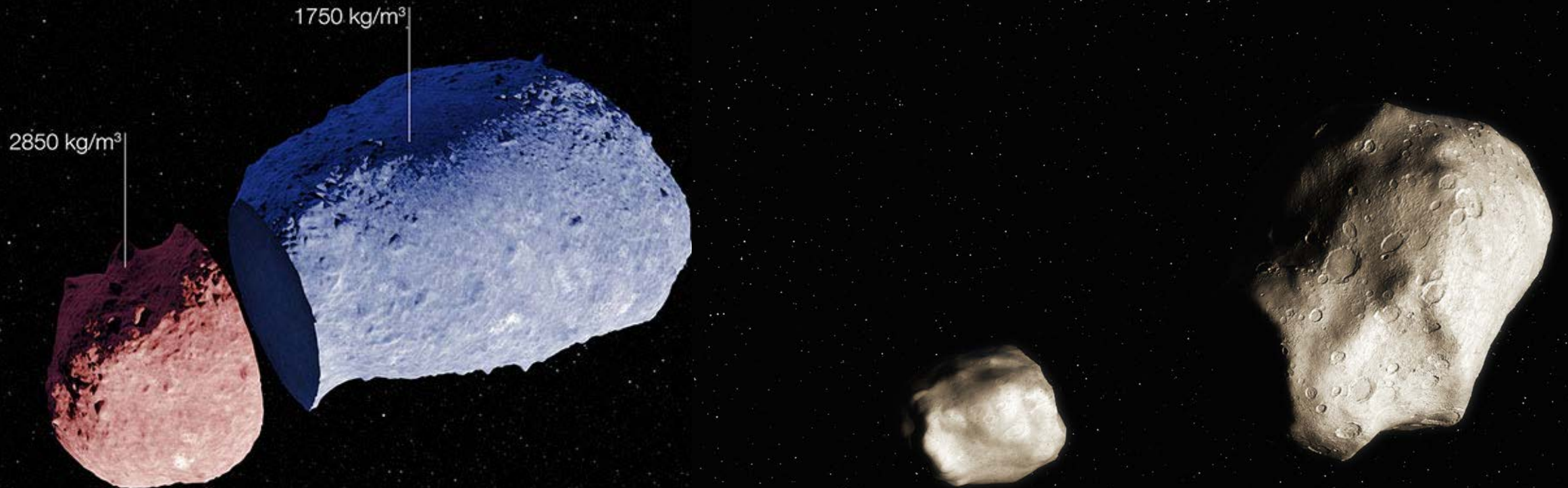


(f)



# LUNAR ASTEROID COLLISION

Asteroid impact with large moon, breaking it into two smaller moon, Phobos and Deimos.



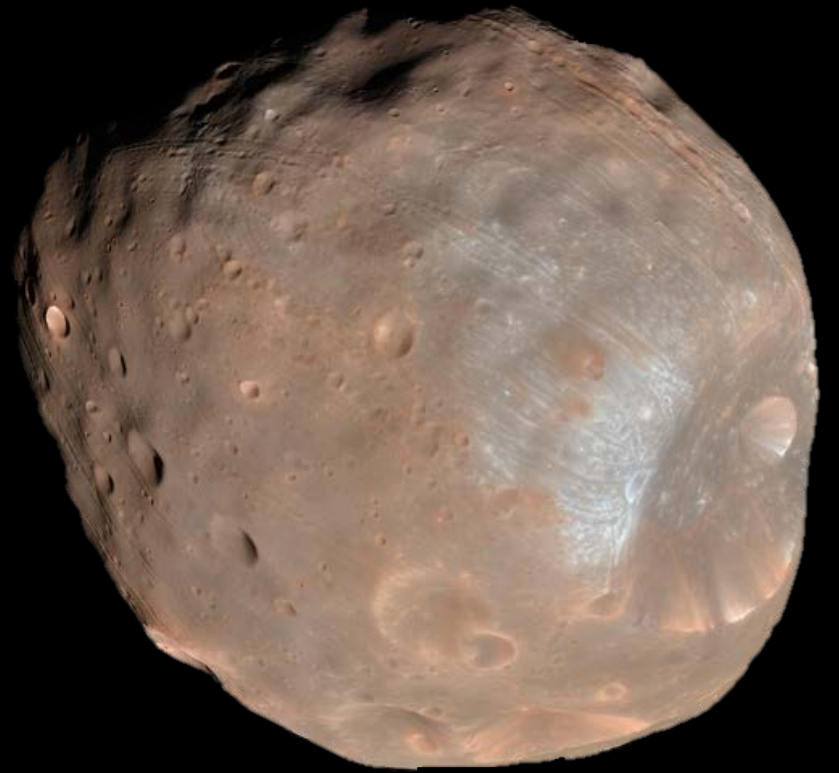
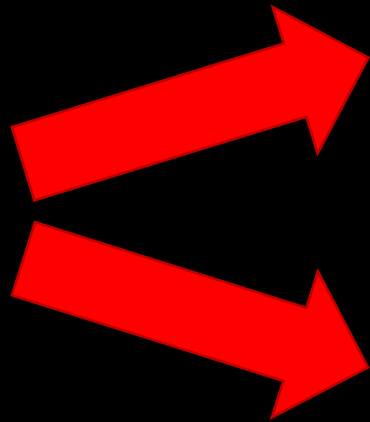
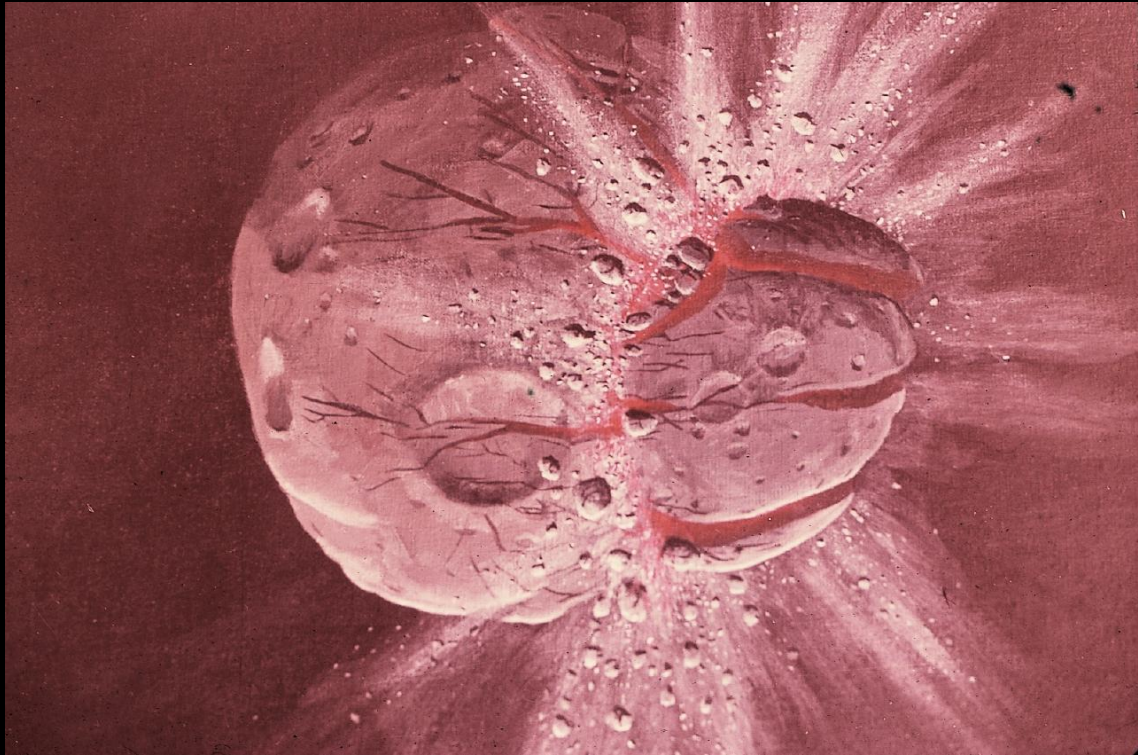
# FOR AND AGAINST THEORY

## SUPPORTING EVIDENCE

- Again, Late Heavy Bombardment means such collisions were common in Mars' early history
- Moons have similar compositions

## DISPROVING EVIDENCE

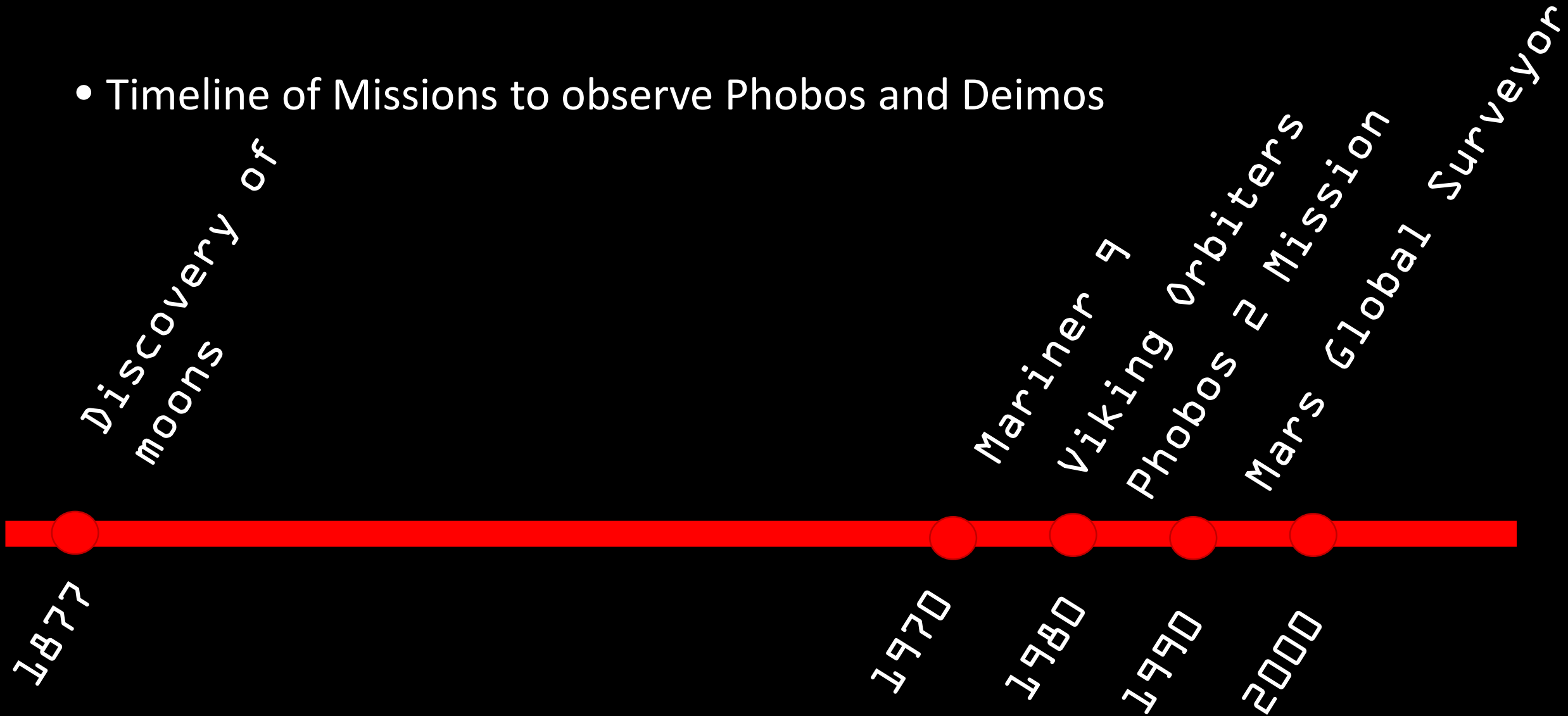
- Asteroid big enough to separate a moon would be more likely to crush it into small pieces, 2 sizeable bodies capable of becoming moons is unlikely





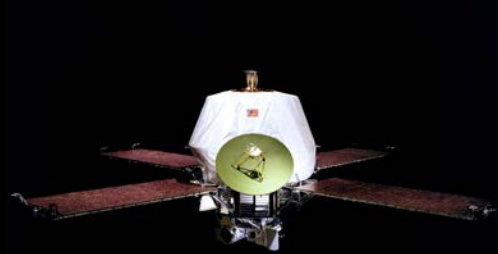
# EXPLORATION OF MARS' MOONS

- Timeline of Missions to observe Phobos and Deimos



# DETAILED TIMELINE

1970

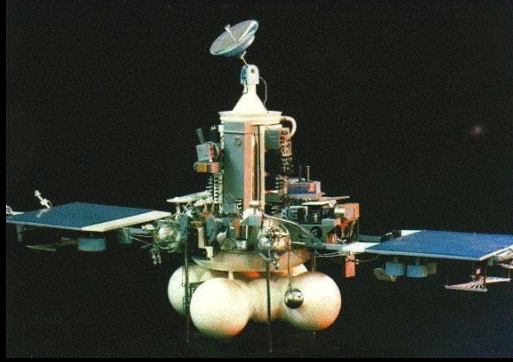


Mariner 9



Viking Orbiters

1980



Phobos 2 Mission

1990



Mars Global Surveyor

2000

# FUTURE MISSIONS FOR PHOBOS AND DEIMOS

- Scientists have considered using Phobos as a base for astronauts to observe the Martian surface
- This could be useful as the camp would be protected from Sun's harmful radiation 2/3 of every orbit
  - Mars would act like a shield from cosmic rays

WORK THE NIGHT SHIFT  
ON MARS' MOON

