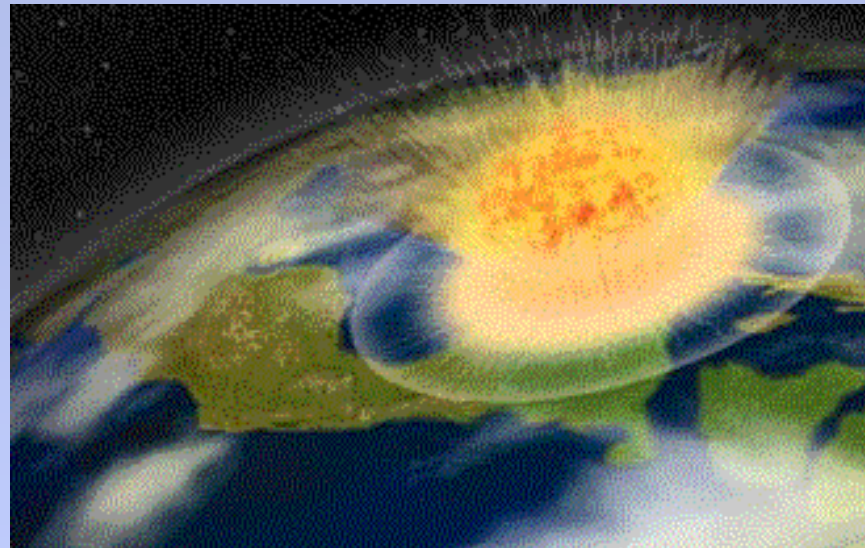


# **FIRE FROM THE SKY**

## **Calculating Doomsday's Date**



**Dr Bonnie Steves**  
**Glasgow Caledonian University**  
**Scotland**

# Asteroid 1997 XF11 hits the headlines!

Friday 13 March 1998

6:30pm, 26 October, 2028:  
could this be the deadline for  
Armageddon?

October 26, 2028 could  
be our last day

Wake-up call  
to world

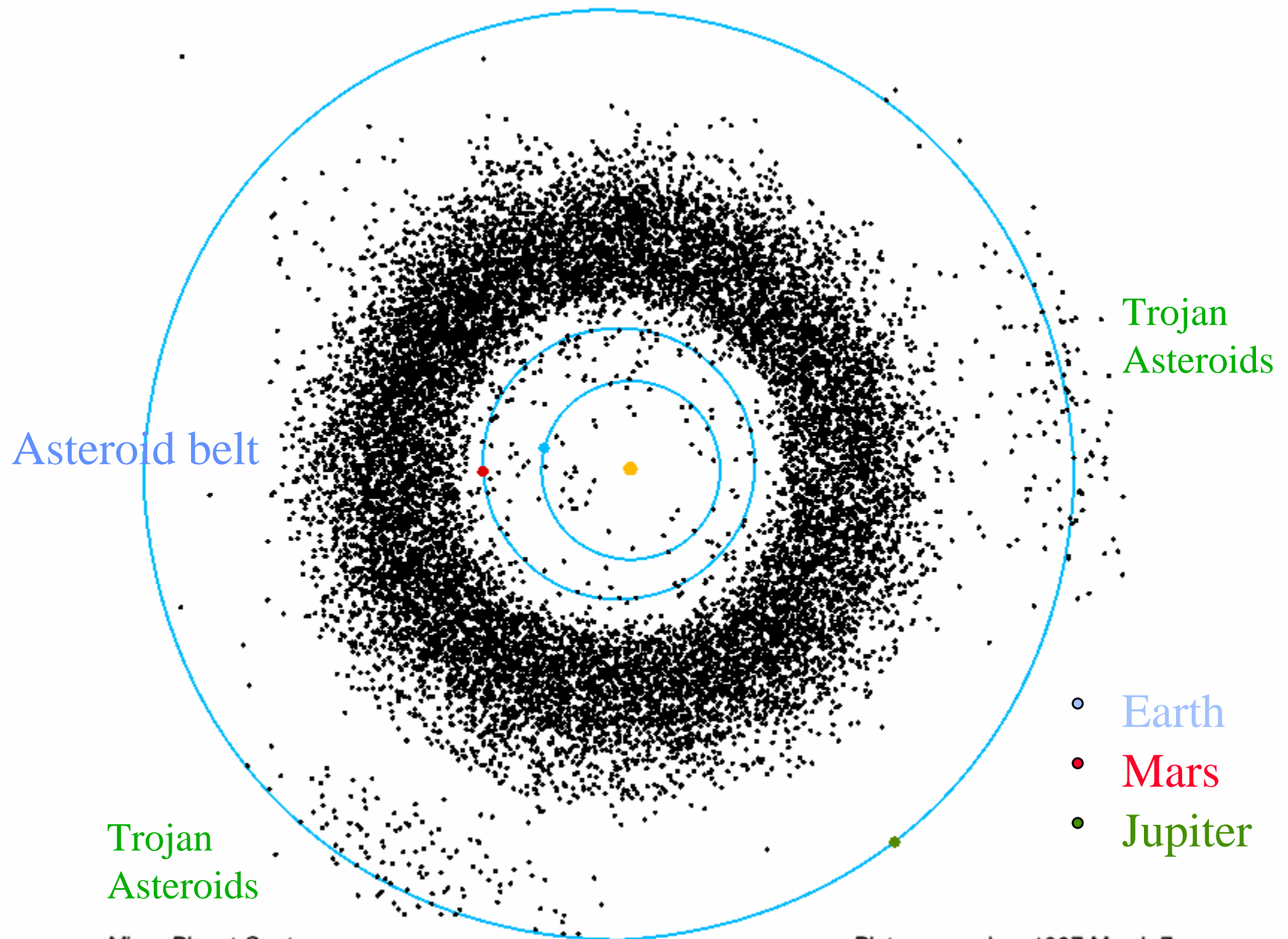
It could be us: 1000-1 chance  
of asteroid hitting Earth

Asteroid leaves us staring at  
apocalypse

... speck of light in the  
night sky but at 6:30 pm on the  
26th of October 2028 scientists  
say it could kill us all

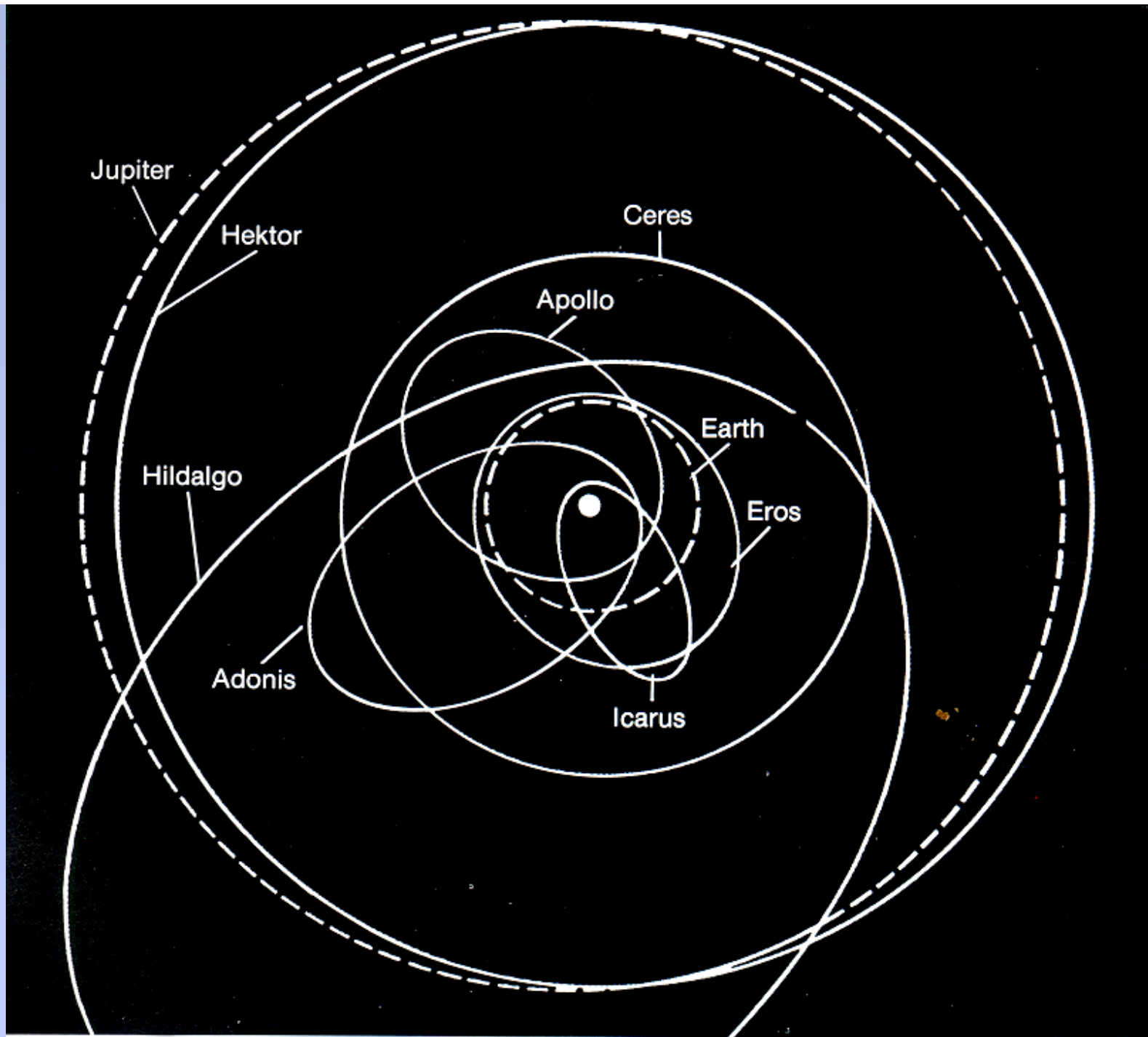
Now the Big  
Bang theory  
that could end  
it all

Asteroid may spell doom  
for human civilisation

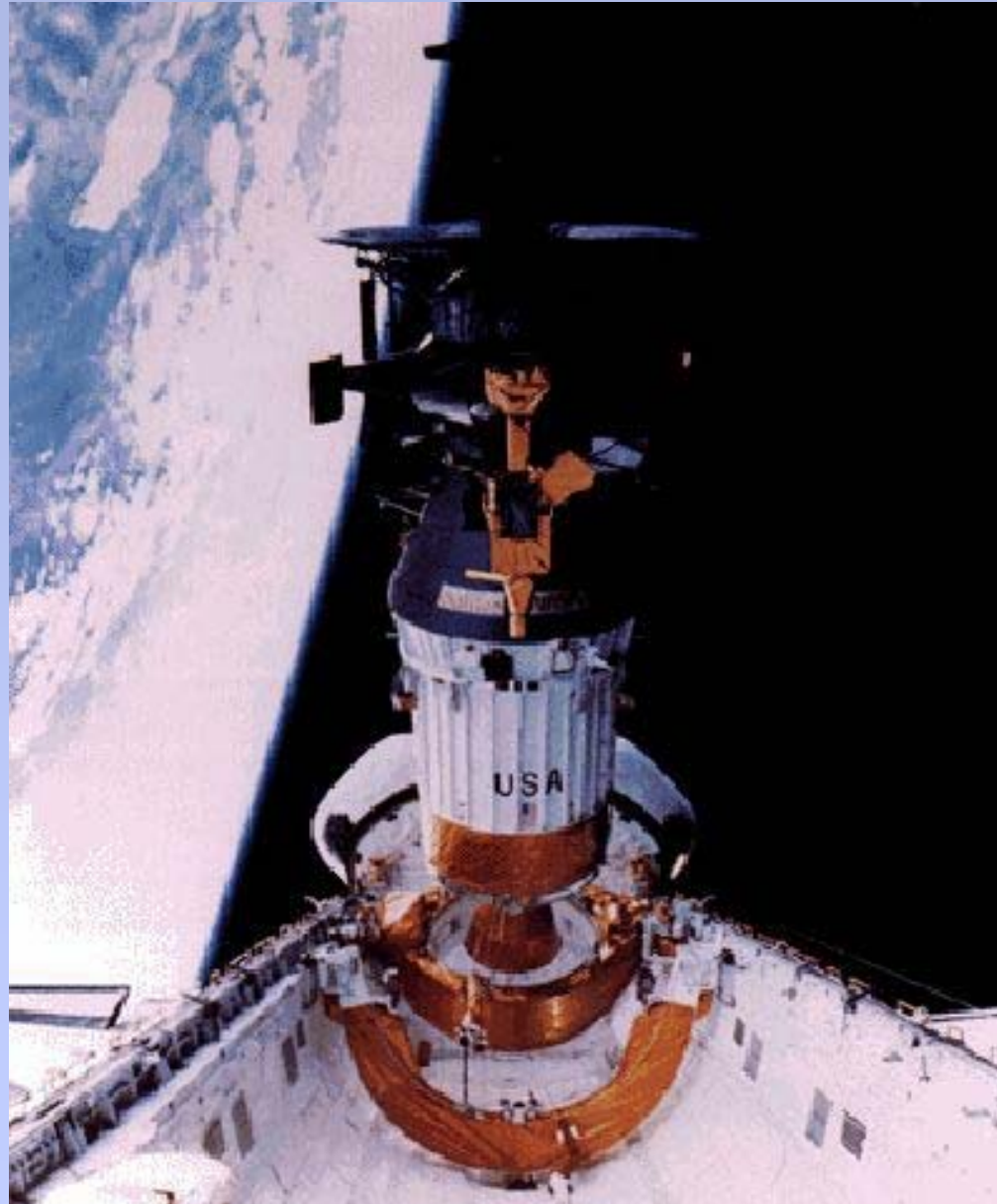


Minor Planet Center

Plot prepared on 1997 March 7



# Deployment of Galileo above Earth





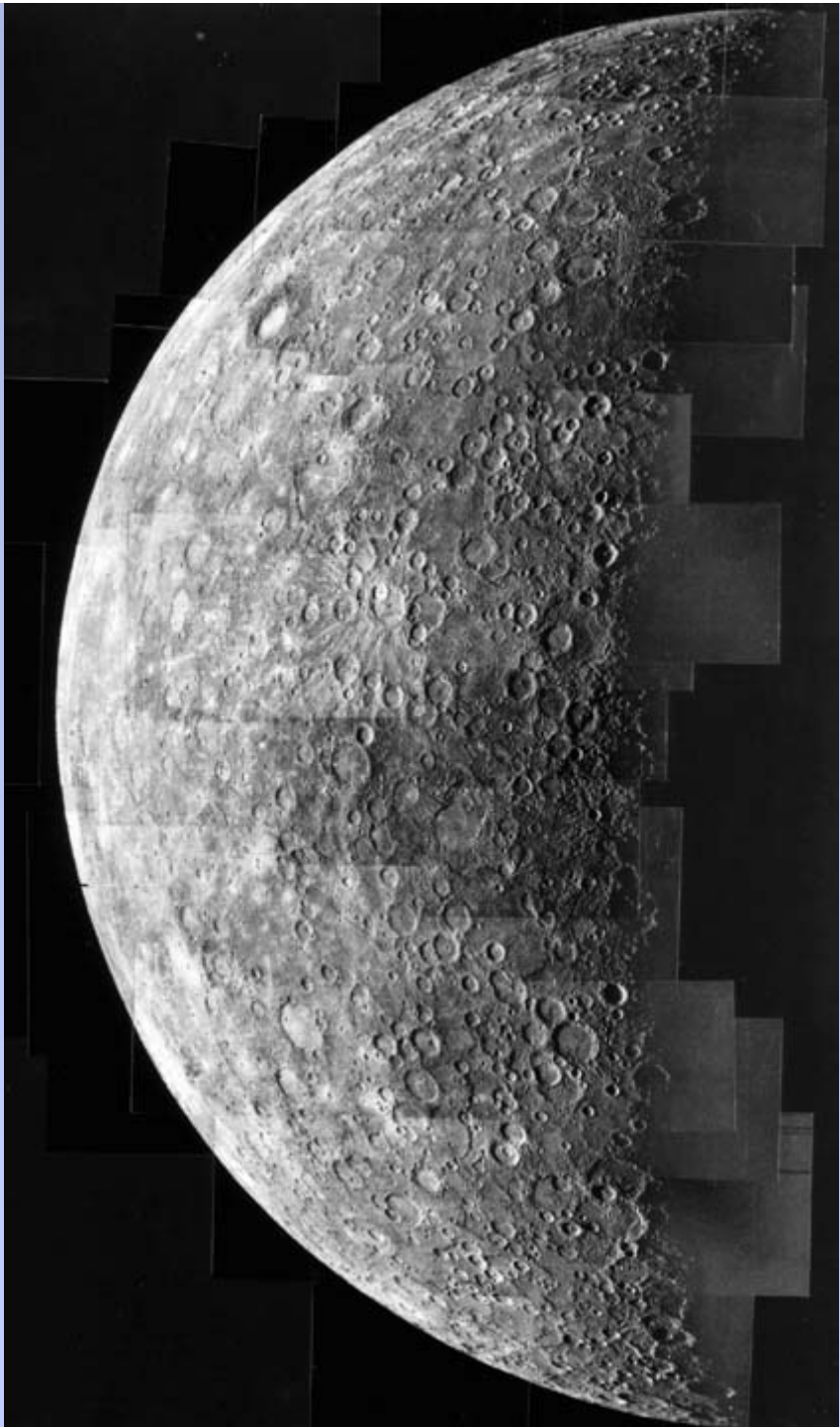




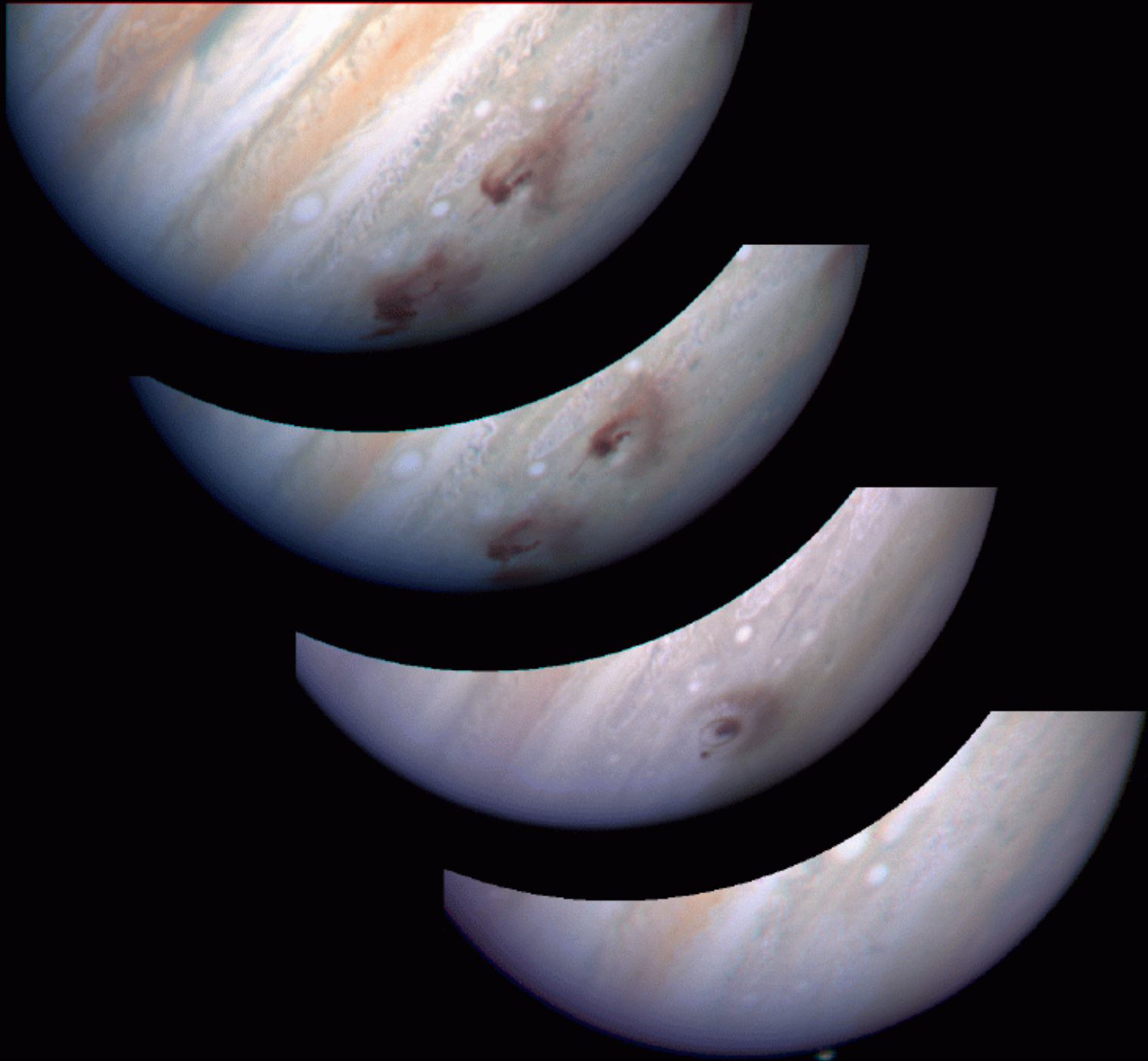


# Galileo arrives at Jupiter



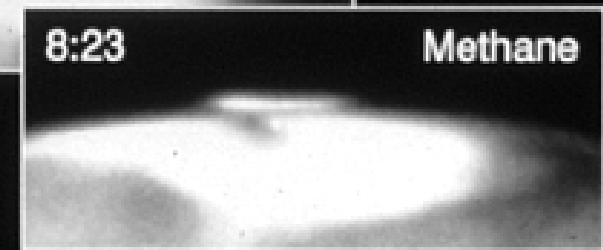
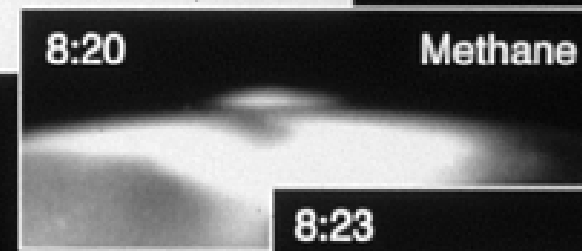
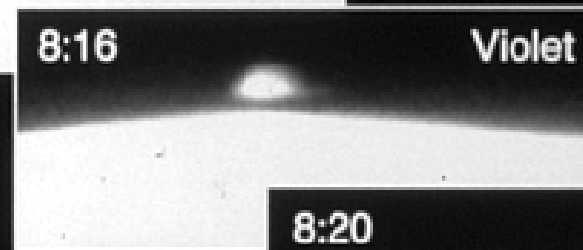




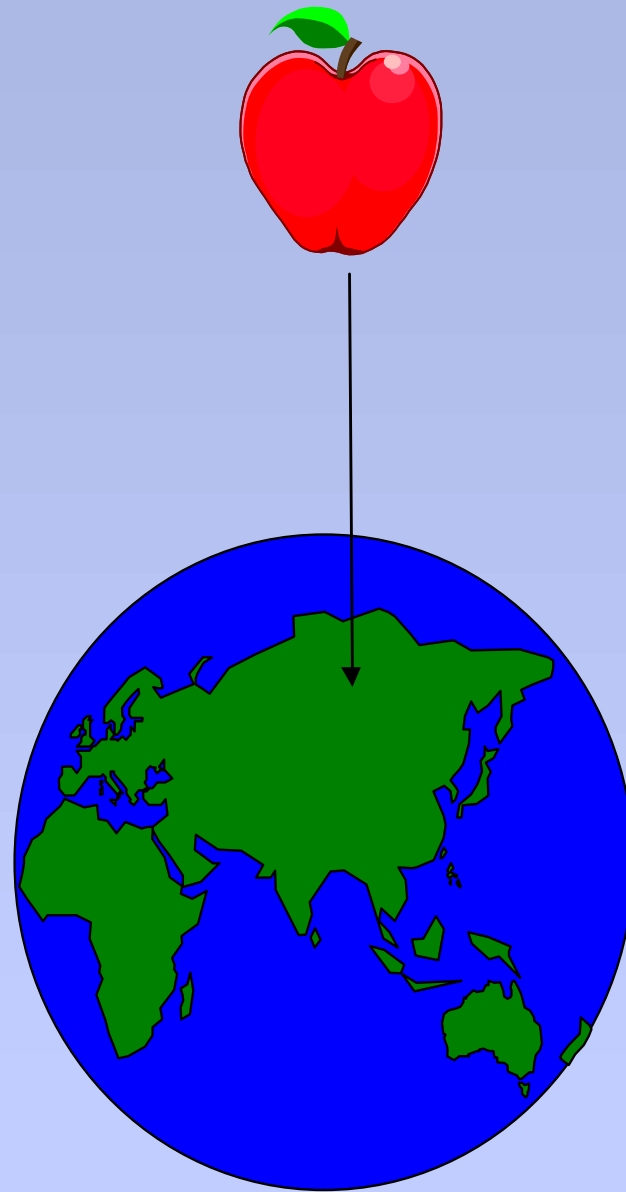
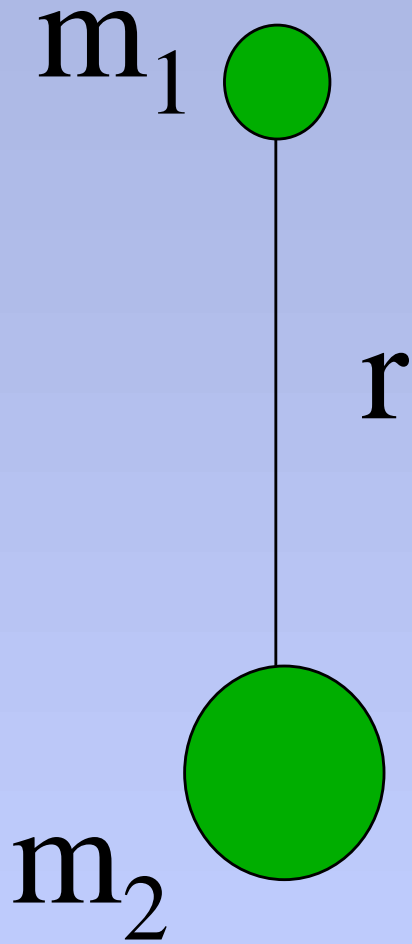


# Jupiter - W Impact

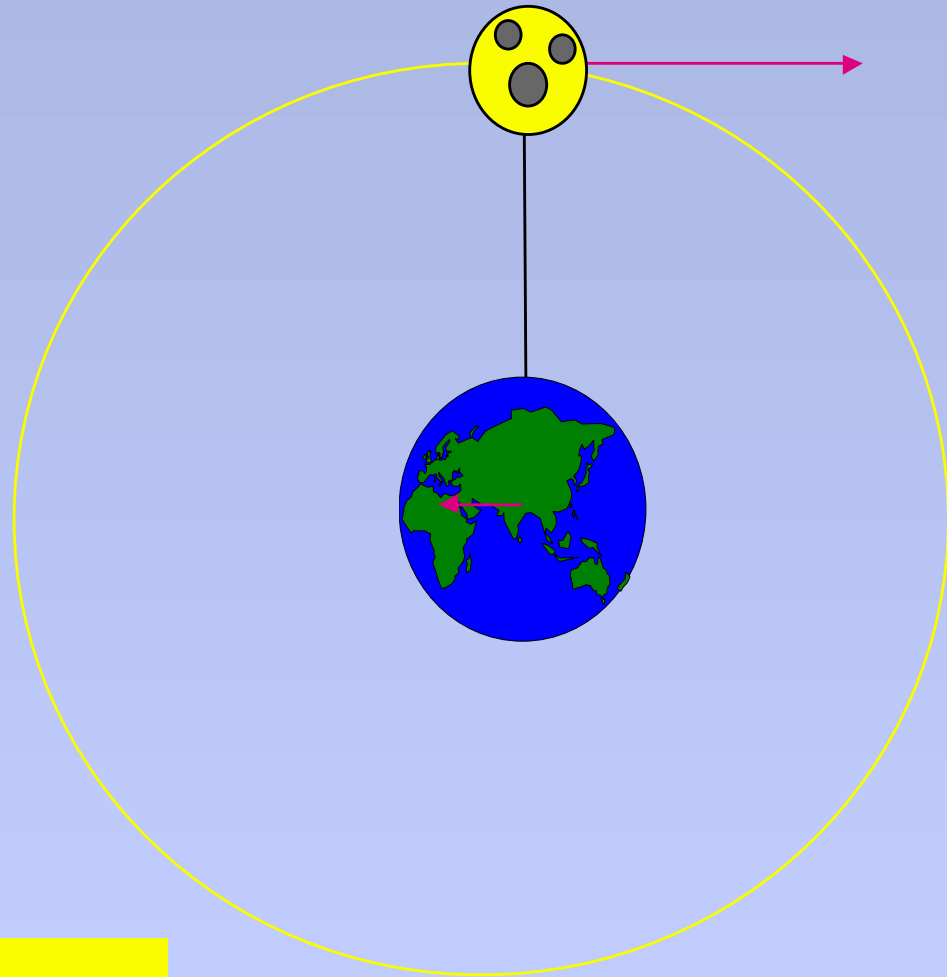
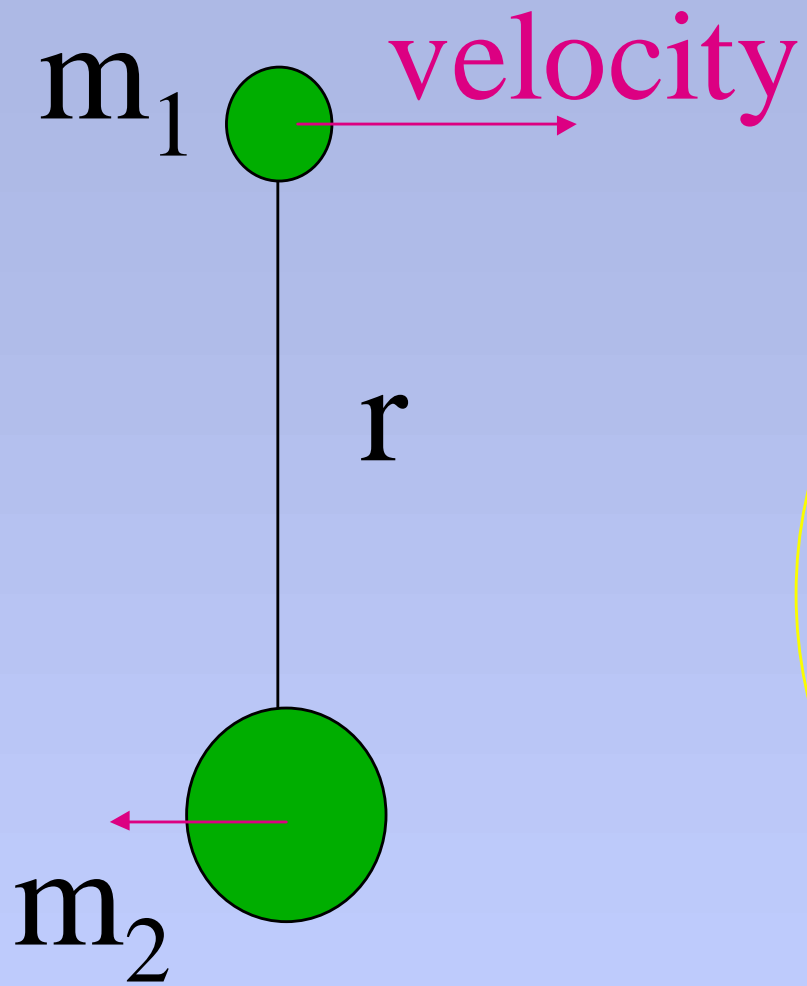
July 22, 1994



Hubble Space Telescope  
Wide Field Planetary Camera 2

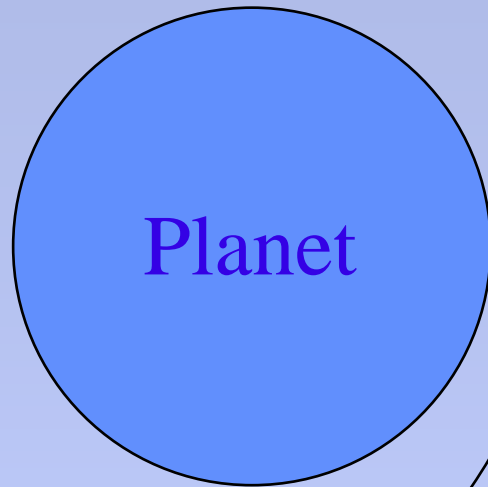


Newton's Apple



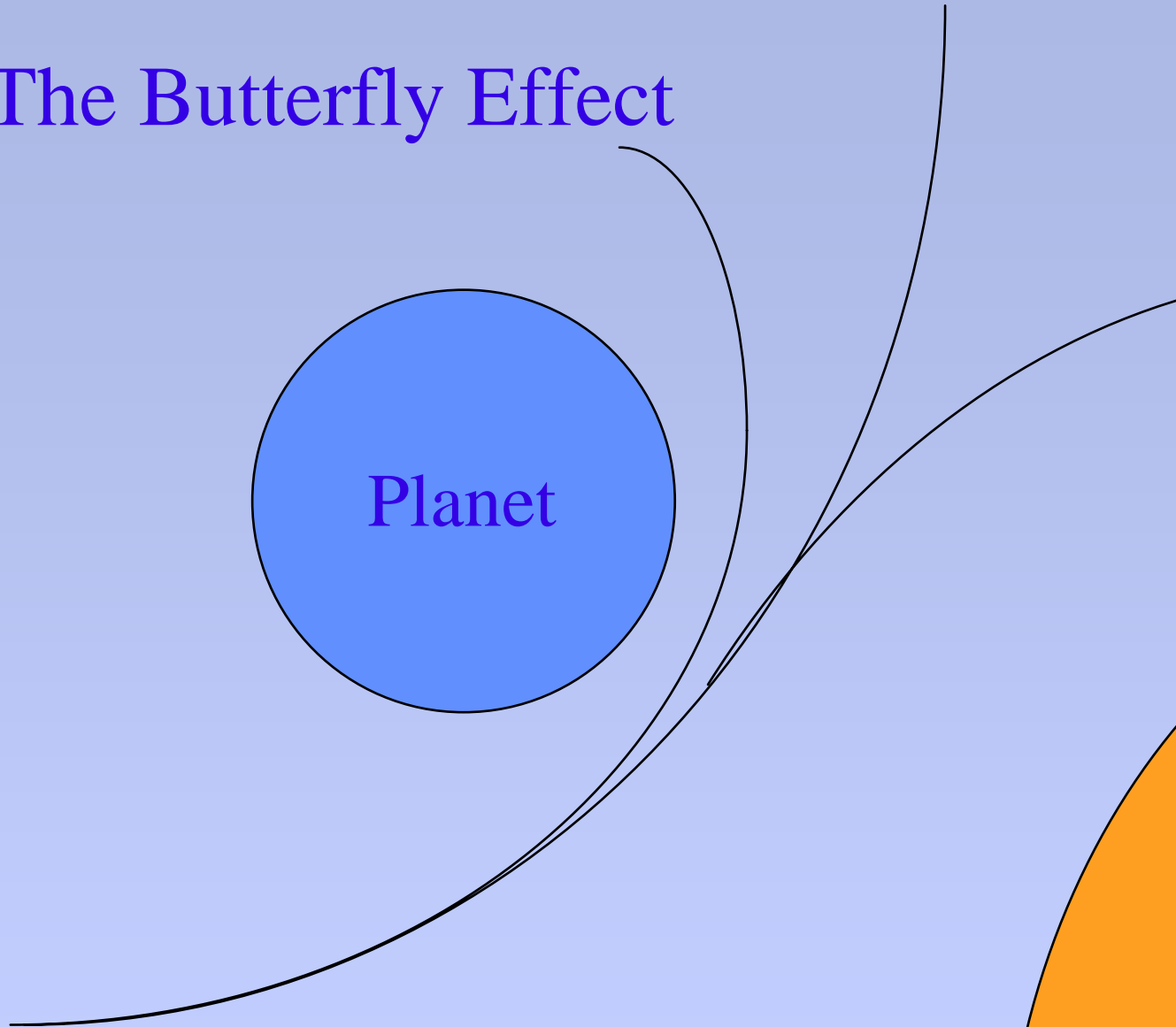
Newton's Moon

# The Butterfly Effect

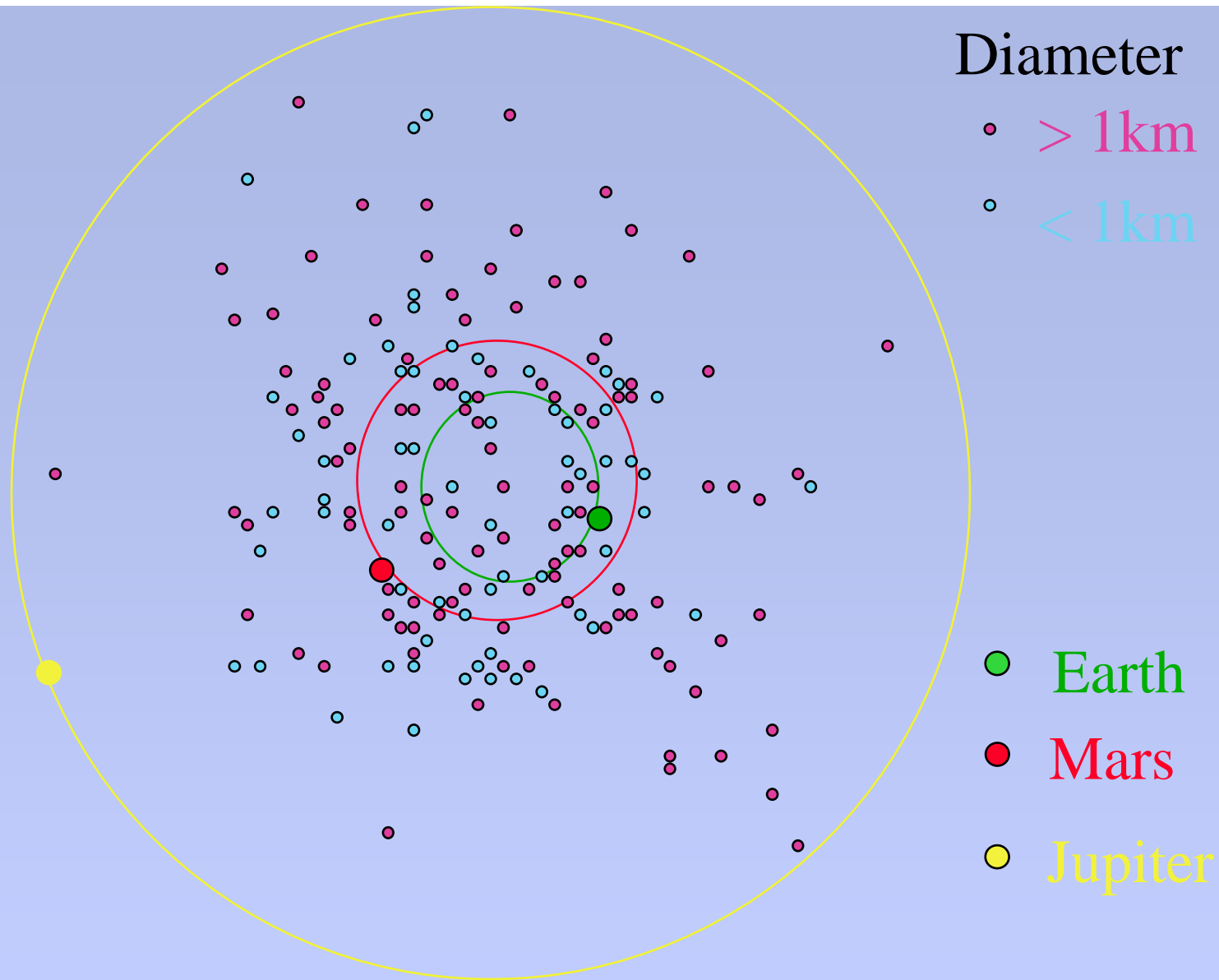


Star

Very similar  
starting points







Diameter

• > 1km

• < 1km

● Earth

● Mars

● Jupiter

Positions of 178 Earth-Crossing Asteroids  
on Sept. 1, 1993

*Bowell & Muinonen, 1994*

# Closest Approaches to the Earth by Minor Planets

Distance (AU)	Date
0.0007	1994 Dec. 9
0.0010	1993 May 20
0.0011	1994 Mar. 15
0.0011	1991 Jan. 18
0.0029	1995 Mar. 27



Meteor Crater, Arizona, USA

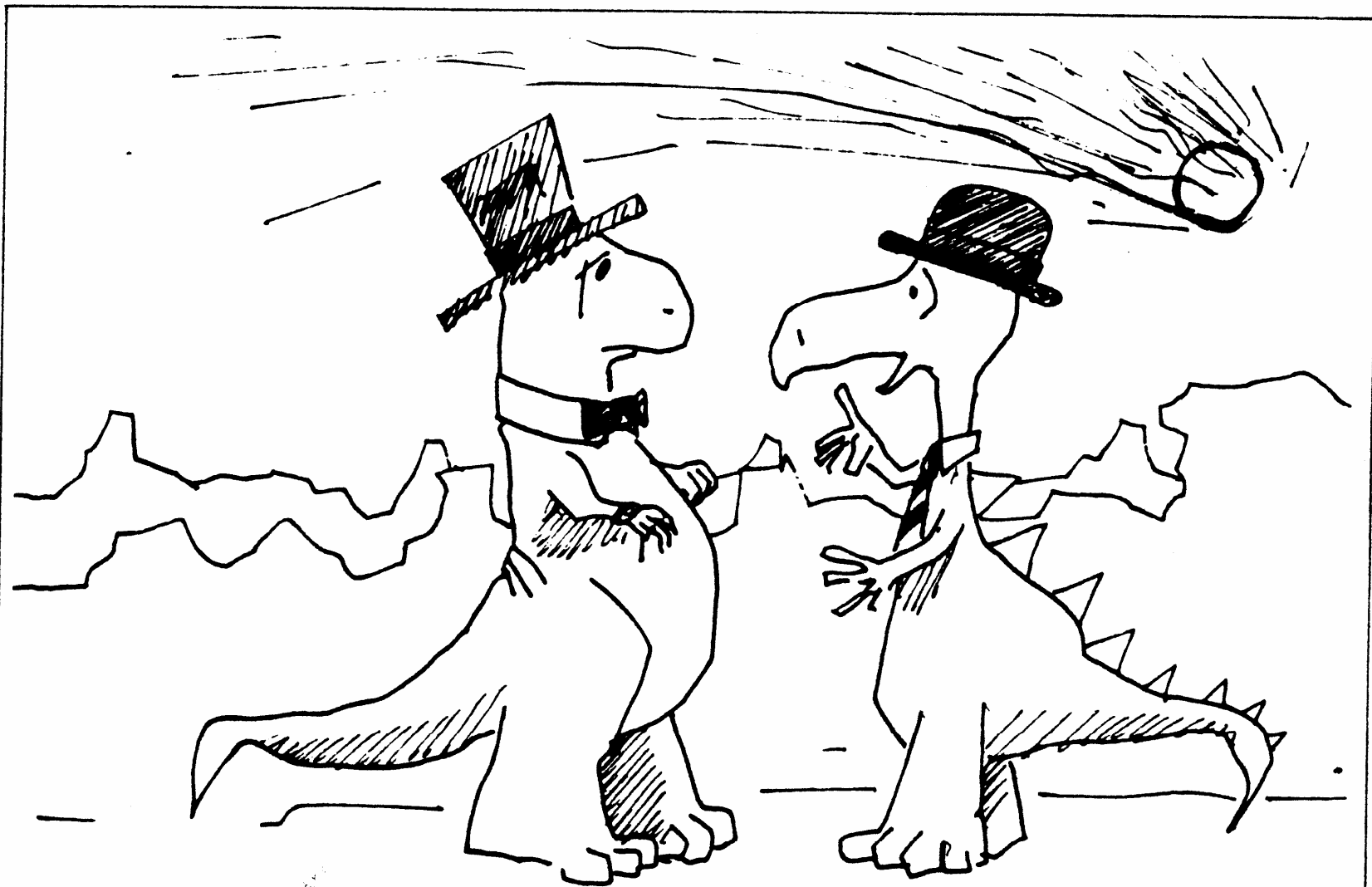


## Impact Craters on Earth

Approximately 130 identified



*Don Davis, NASA*



"You do realise that if it strikes the Earth, it will be the end of civilisation as we know it!"



*Don Davis* NASA



*Don Davis* NASA



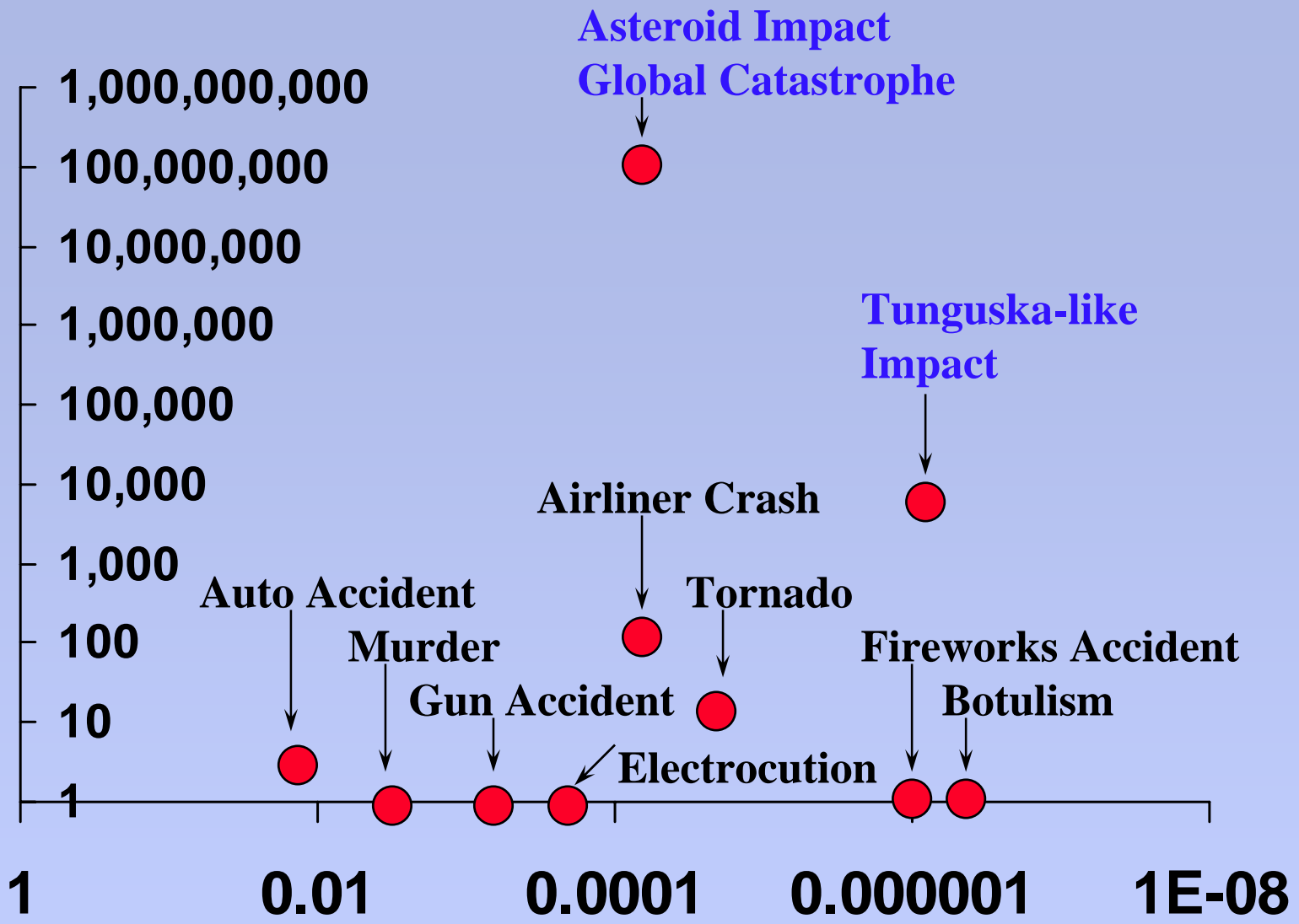
# Global Catastrophe

- **300,000 years between impacts**
- **Considerable fraction of population killed**
- **Annual risk: 1/2,000,000 per person**
- **Mass mortality, global disruption**
- **Probable threshold size 1-3 km**

# Mass Extinction

- **10,000,000 years between impacts**
- **Almost total population killed**
- **Annual risk: 1/30,000,000 per person**
- **Possible extinction of humans**
- **Probable threshold size 10-15 km**

**Number Killed Per Event (USA)**



**Probability of Death**



Spaceguard UK

**SPACEGUARD CANADA**

Spaceguard  
Australia

German Spaceguard  
Foundation

*Nec cum fiducia inveniendi*



Japan Spaceguard  
Association

Spaceguard  
Croatia

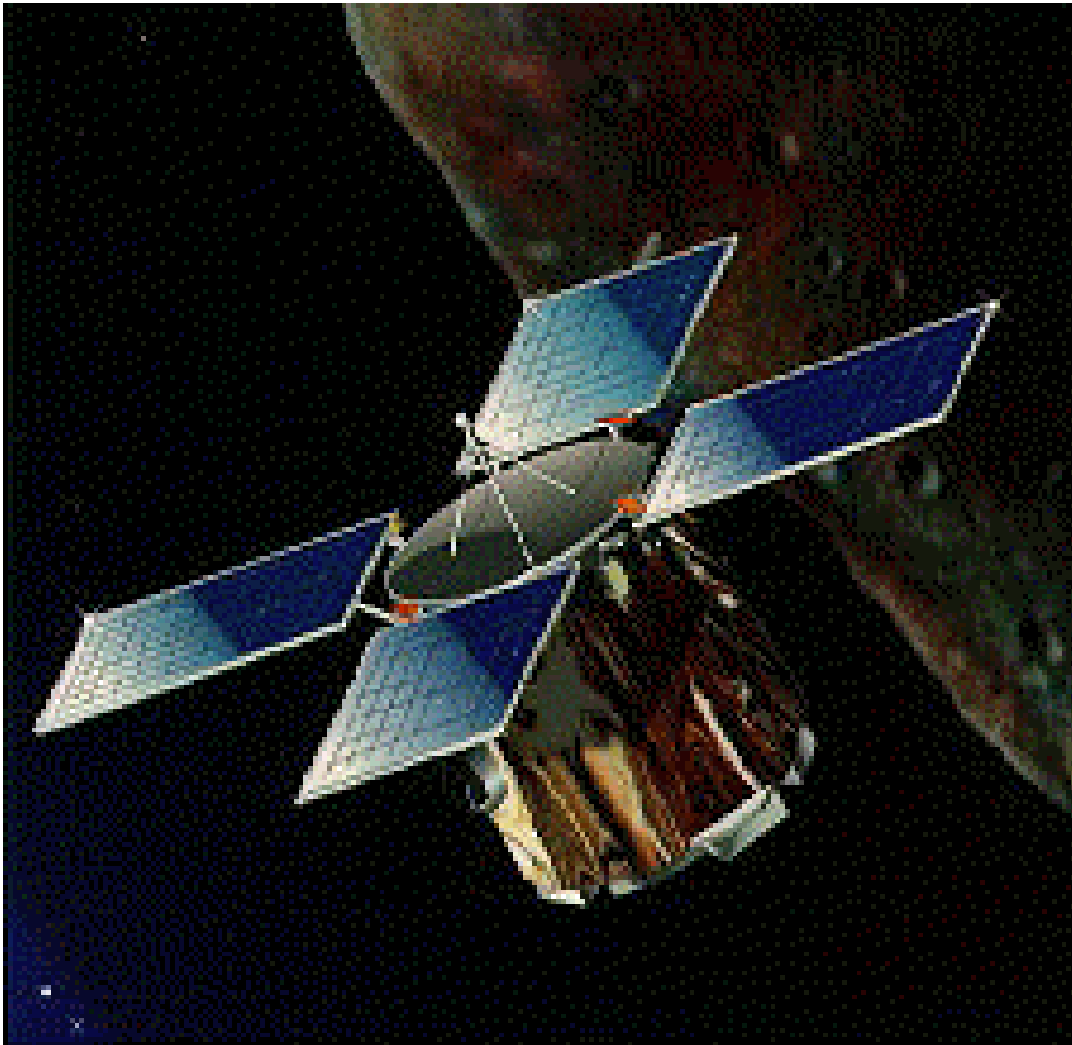
*Nec sine spe*

IAU - Minor  
Planet Center

**Spaceguard Foundation**

Near-Earth Asteroid Tracking  
(NEAT), NASA/JPL

Spacewatch, University  
of Arizona



NEAR - 433 Eros



Feb 12 2000 00:58:00

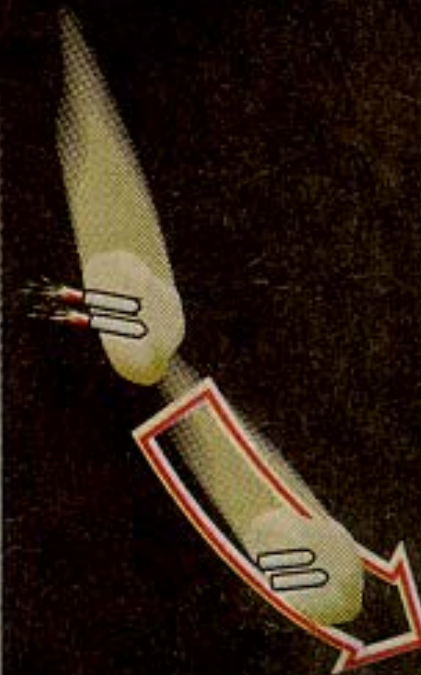
## Taking action



If an attempt is made to shoot the asteroid out of the sky it would produce several smaller asteroids, each with life-threatening potential

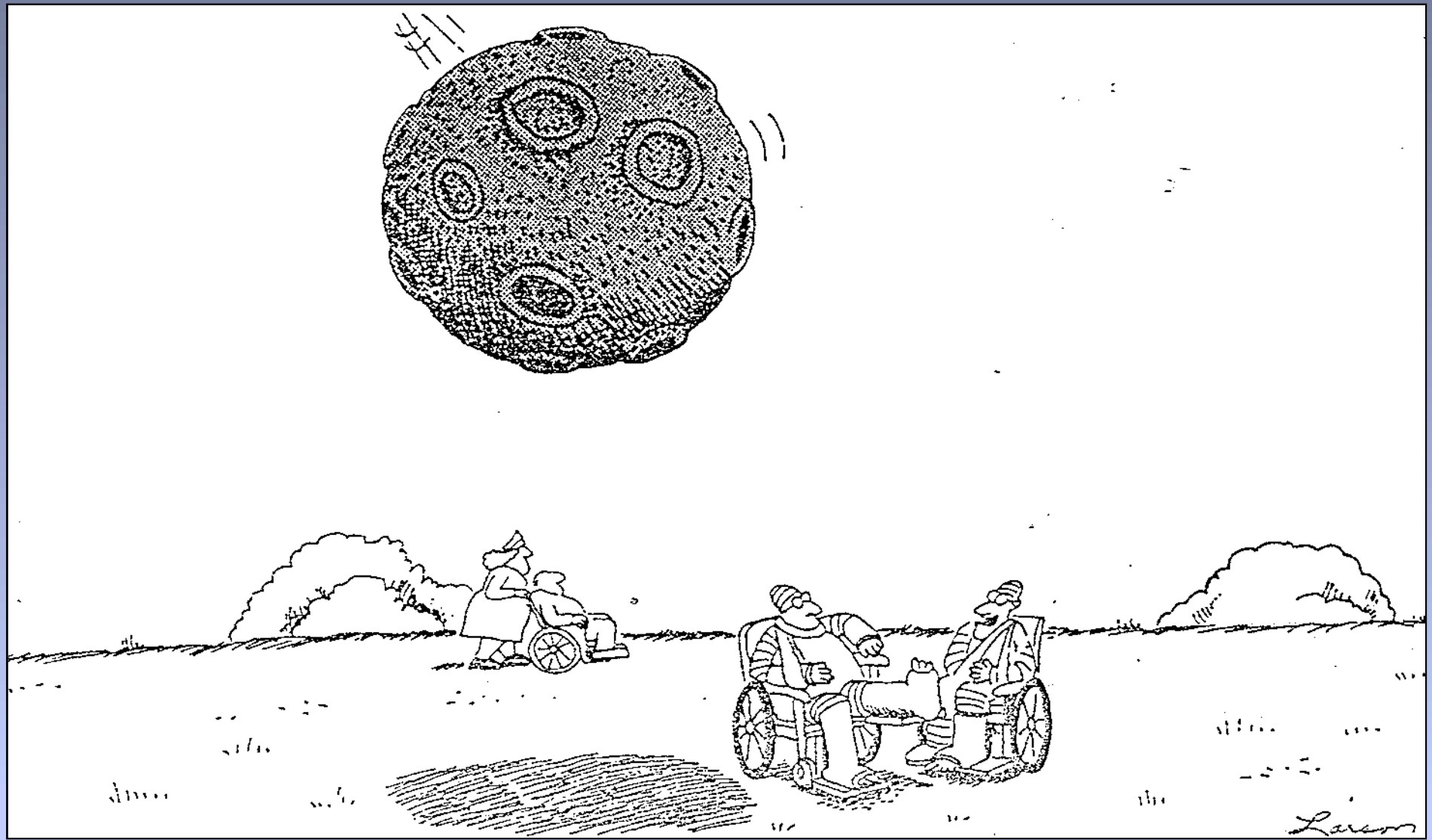


An explosive force planted on the asteroid is hoped to push it off its trajectory without breaking it up



Because the asteroid is travelling relatively slowly, rockets could be attached to it and used to steer it off course





**“You’re kidding! ... I was struck twice by lightning too!”**

**Any Questions?**