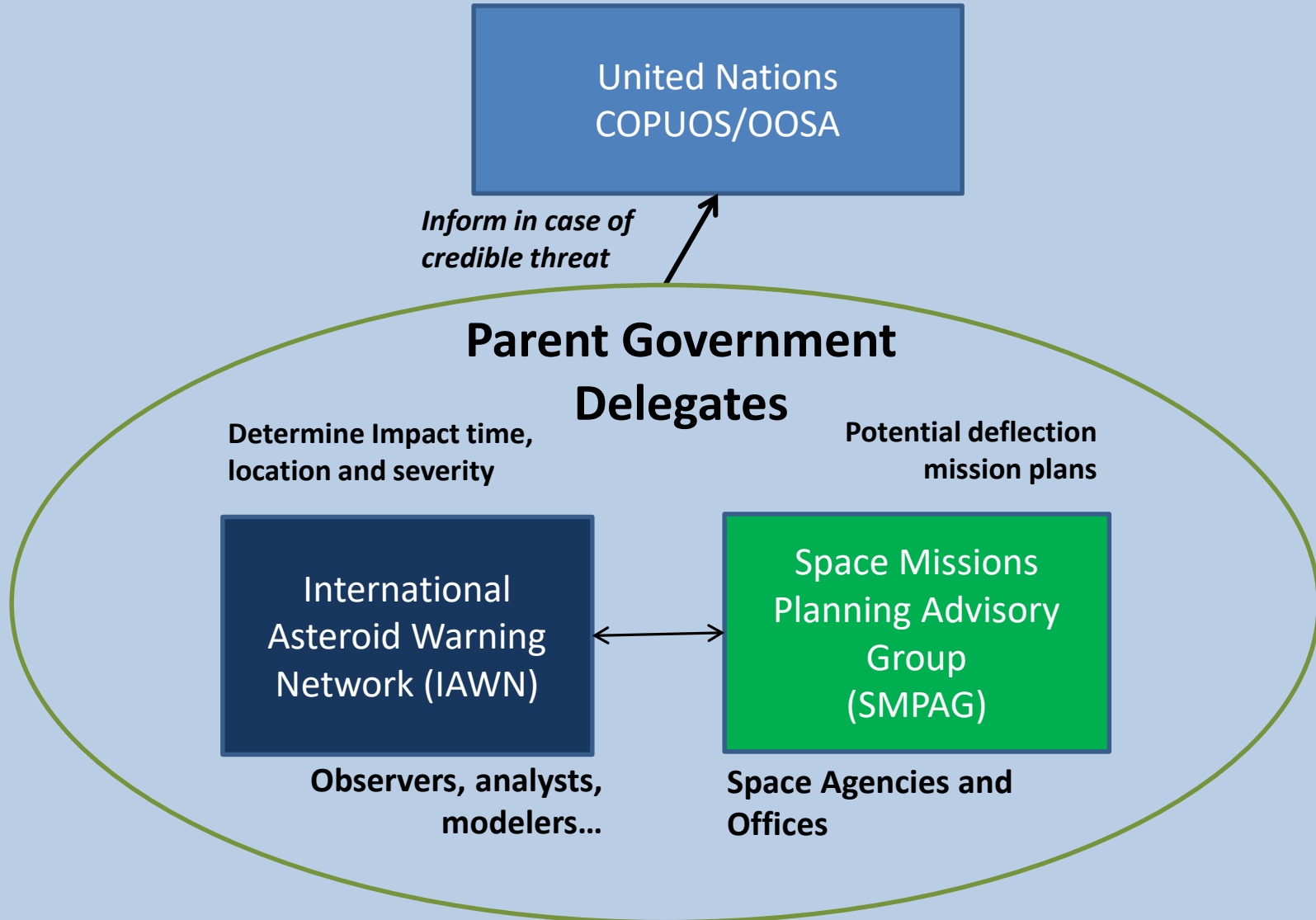


**International Asteroid Warning Network  
(IAWN)  
Status Report to STSC 2018**

*Lindley Johnson  
Representing IAWN  
1 February 2018*



# Signatories to IAWN

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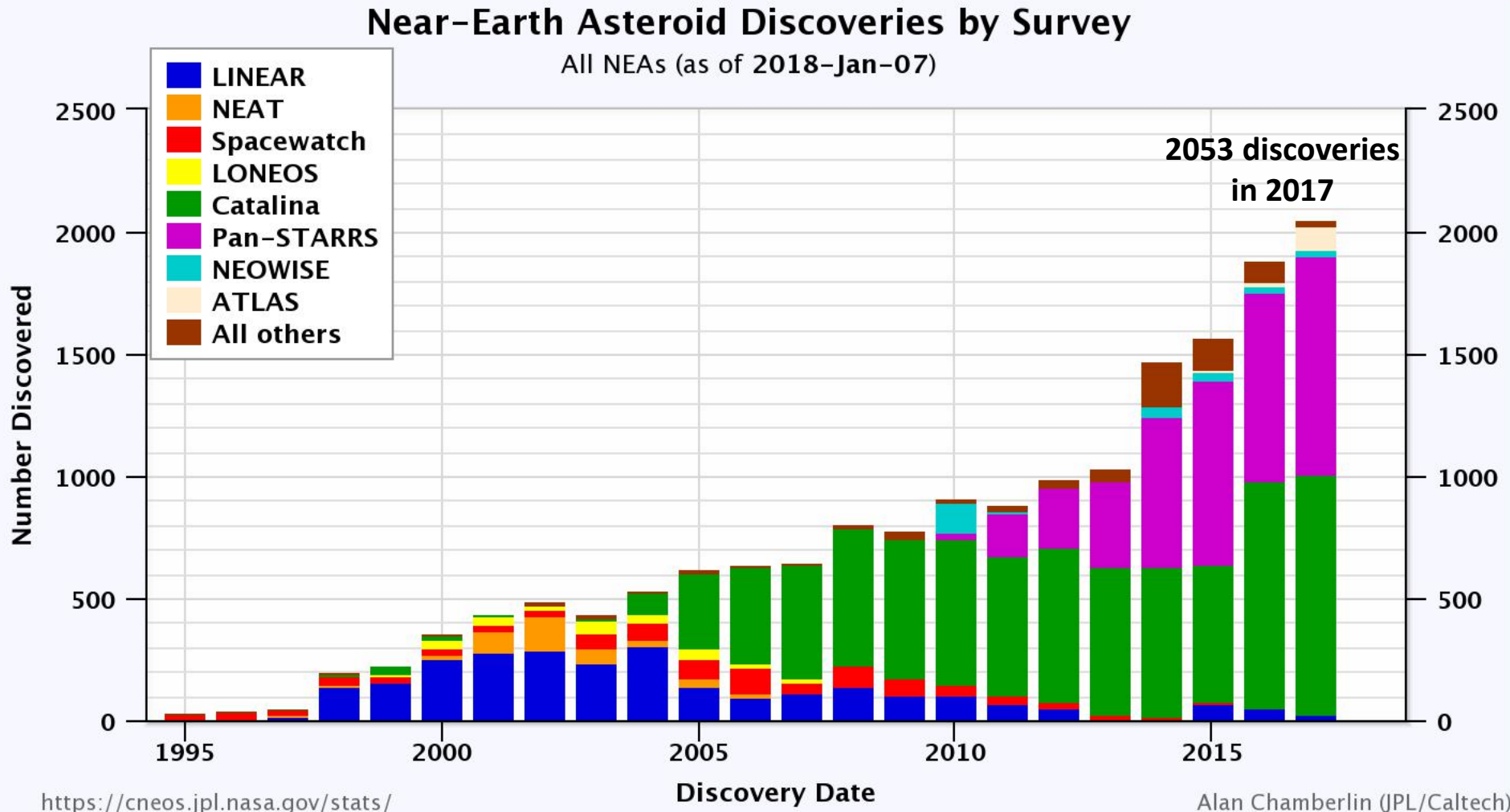
- **KASI — Korean Astronomy Space Science Institute, Daejeon, South Korea**
- **INAOE - the National Institute of Astrophysics, Optics, and Electronics in Cholua, Mexico**
- **INASAN - the Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia**
- **ESO - European Southern Observatory**
- **ESA – European Space Agency**
- **NASA – Includes Minor Planet Center, Center for NEO Studies, 4 major NEO search projects and several characterization projects**
- **University of Nariño, Pasto, Colombia**
- **Peter Birtwhistle, amateur astronomer, West Berkshire, England**
- **The Special Astrophysical Observatory (SAO)**
- **Kourovka Observatory, Ural Federal University**
- **The Institute of Solar-Terrestrial Physics (ISZF)**
- **CNSA – China National Space Administration**
- **Crimean Astrophysical Observatory**

# Worldwide Observing Network

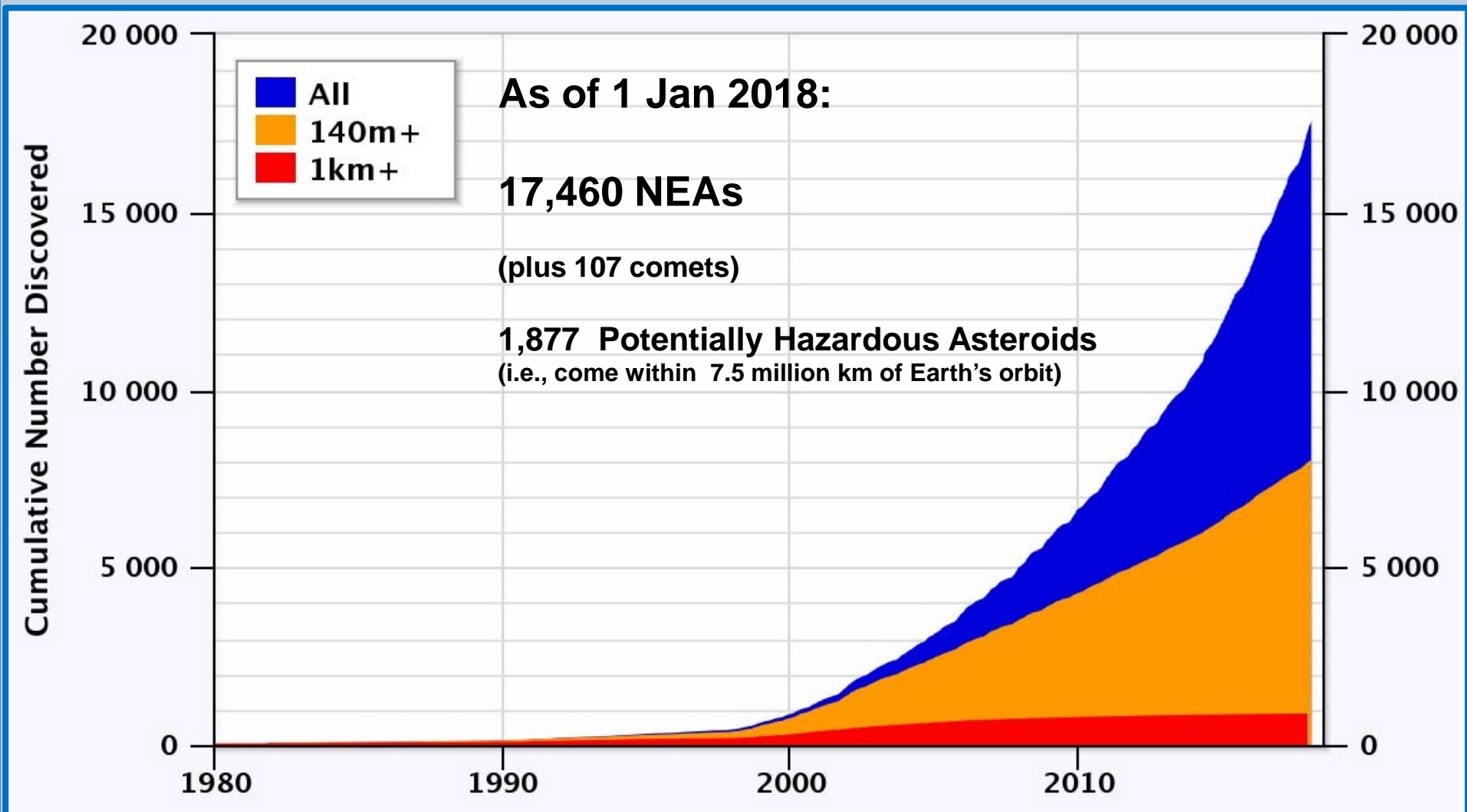


**Received ~22 million observations (~ 201,000 on NEOs) from 47 countries in 2017  
(and one in space!)**

# Near-Earth Asteroids Discovered in 2017



# Known Near-Earth Asteroid Population



# Recovery of 2012 TC<sub>4</sub>

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## Goal:

### Exercise the International Asteroid Warning Network (IAWN)

- **Recovery and Follow-up:** Recovery confirmed early August 2017
- **Characterization:** Light curves, photometry, spectroscopy, radar
- **Modeling:** orbit determination, threat assessment and impact modeling exercises
- **Communications:**
  - Within the NEO community and with the public
  - Within governments and other agencies

# Results of 2012 TC<sub>4</sub> Campaign

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- Astronomers from the U.S., Canada, Colombia, Germany, Israel, Italy, Japan, Romania, Republic of Korea, the Netherlands, Russia and South Africa tracked 2012 TC<sub>4</sub>
- Close approach distance of 43,700 km (on 12 Oct 2017)
- Radar observations of 2012 TC<sub>4</sub> seem to indicate an oblong shape of about 6 x 12 meters in size
- Light curve and then radar showed it tumbling with about a 12 minute period
- Precision orbit determination was able to rule out any impact by 2012 TC<sub>4</sub> for the foreseeable future
- More information: <http://2012tc4.astro.umd.edu/>



# Radar Imagery of Florence



- Discovered by in 1981 (1981 ET<sub>3</sub>)
- ranks 4<sup>th</sup> in size of large PHOs
- Came within 0.047 AU (~7 million km) of Earth on 1 Sept 2017
- 3<sup>rd</sup> NEO found to be a ternary system

Radar imagery of Florence, which measures just over 4 km across, revealed surface features along with two moonlets orbiting the asteroid. The inner moon is ~180 to 240 meters across while the outer moon is larger at ~360 meters in size.

# Discovery of Interstellar Object: 1I/2017 U1 ('Oumuamua)

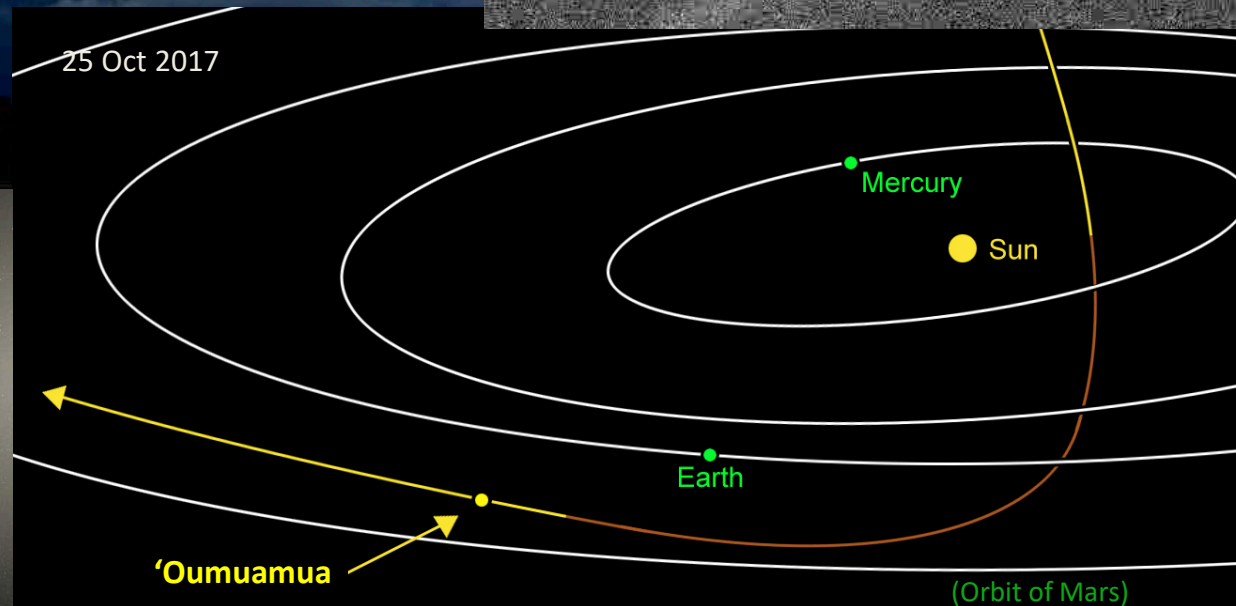
On 19 October 2017, the Pan-STARRS 1 survey telescope on Haleakala discovered the first interstellar object; a small asteroidal body not bound to our Solar System. 1I/2017 U1 is highly elongated.

(real image)

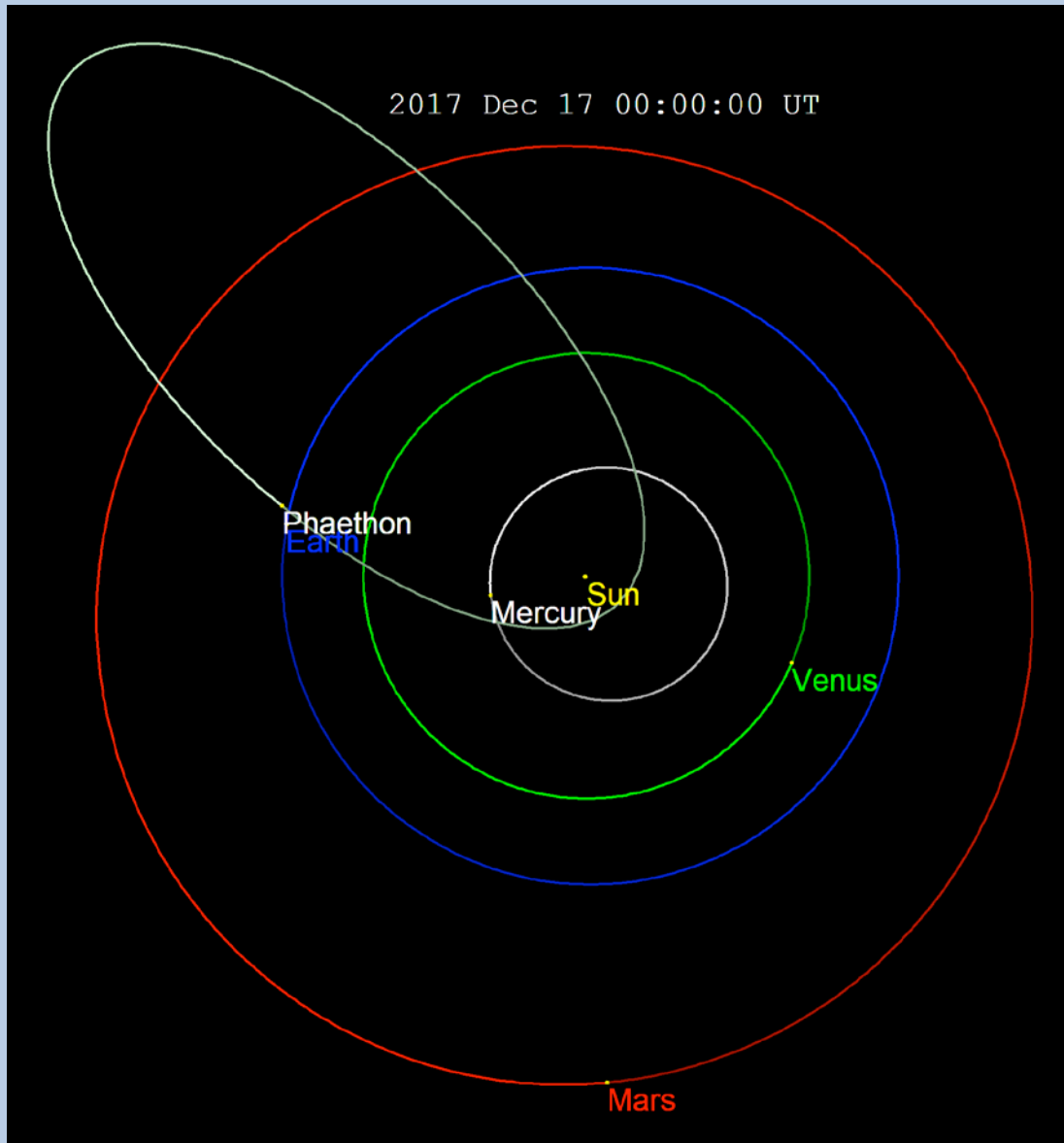


Pan-STARRS 1 on  
Haleakala Summit, Maui, Hawaii

(artist's concept)



# 3200 Phaethon Close Approach



- Discovered in 1983
- ~5.8 km in diameter
- Came within 0.121 AU (~18 million km) of Earth on 10 Dec 2017
- Parent body of Geminids meteor shower