Thinking Big

How Far is Safe in Space?

NASA / AURA / STSCI

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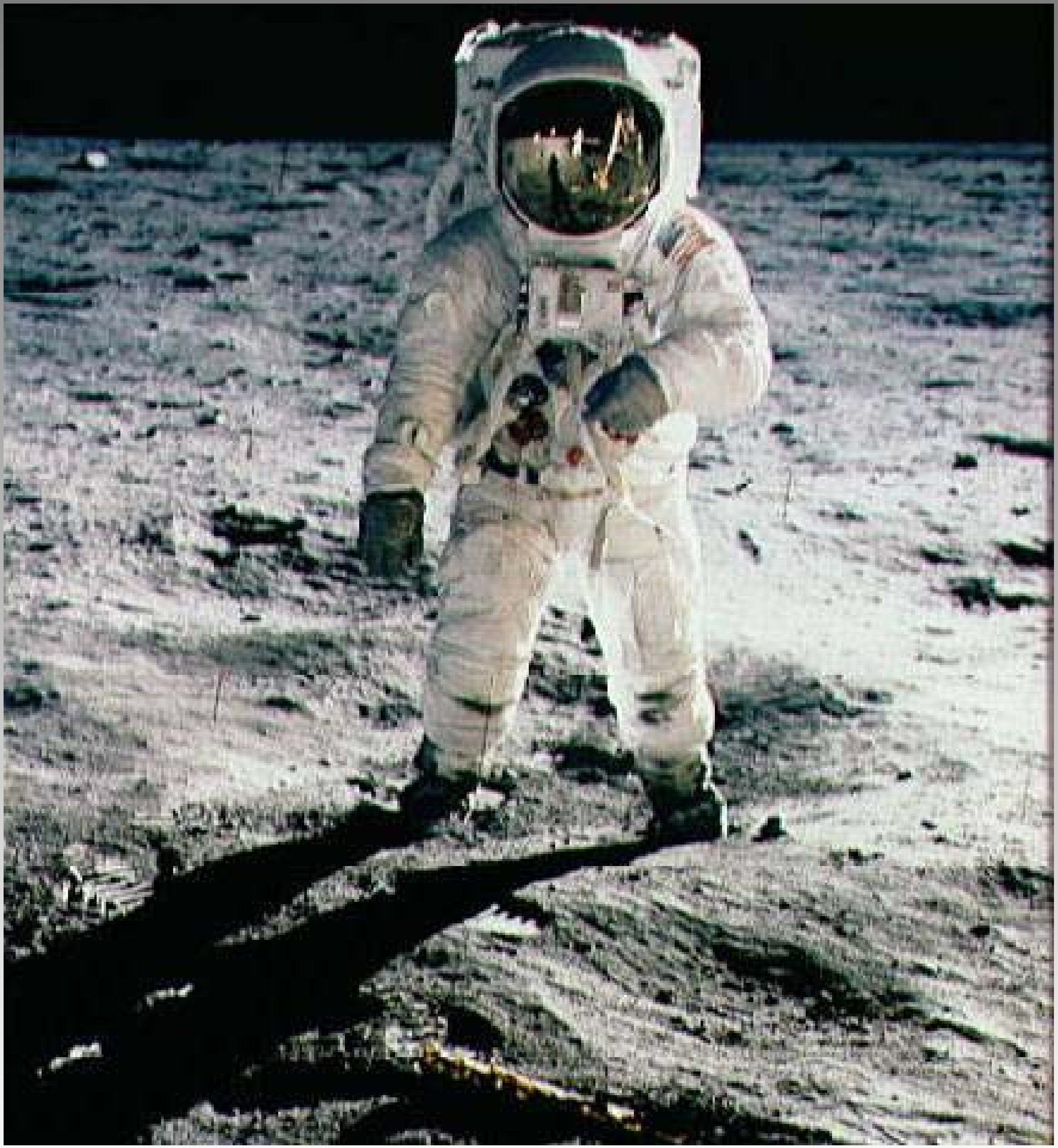
Which is the better scale model of the earth?

Bowling ball

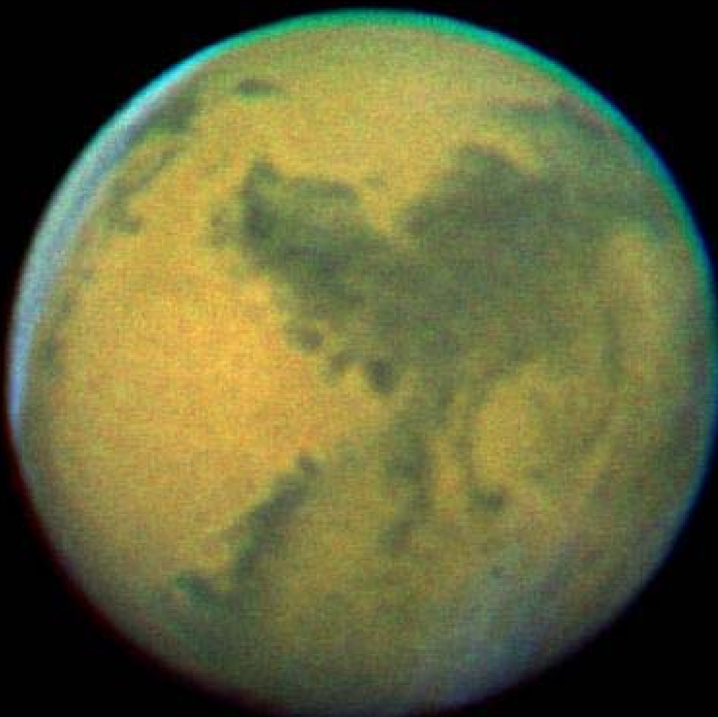
Orange

"That's one small step for man, one giant leap for mankind."

-Neil Armstrong, July 21, 1969



Realistic Possibility:
Mars



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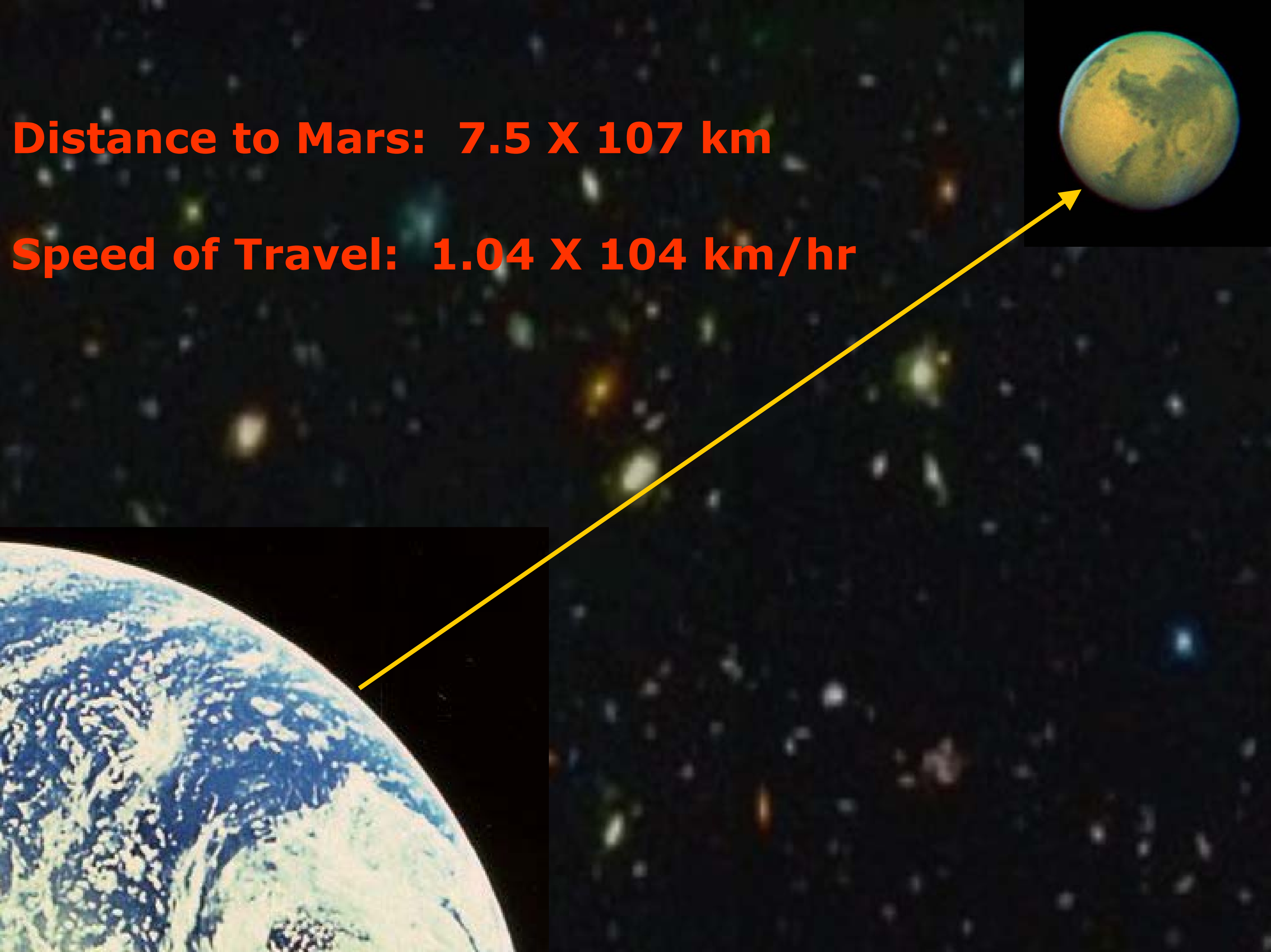
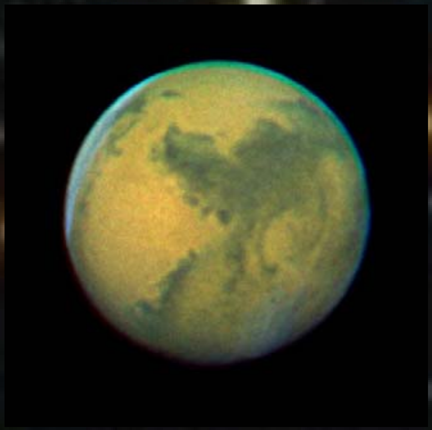

Distance to Mars: 7.5 X 107 km
Speed of Travel: 1.04 X 104 km/hr

Distance to Mars = 7.5×10^7 km

Speed of travel = 1.0×10^4 km/hour



$$\frac{\text{Distance}}{\text{Speed of travel}} \quad \frac{7.5 \times 10^7 \text{ km}}{1.04 \times 10^4 \text{ km/hour}}$$

=

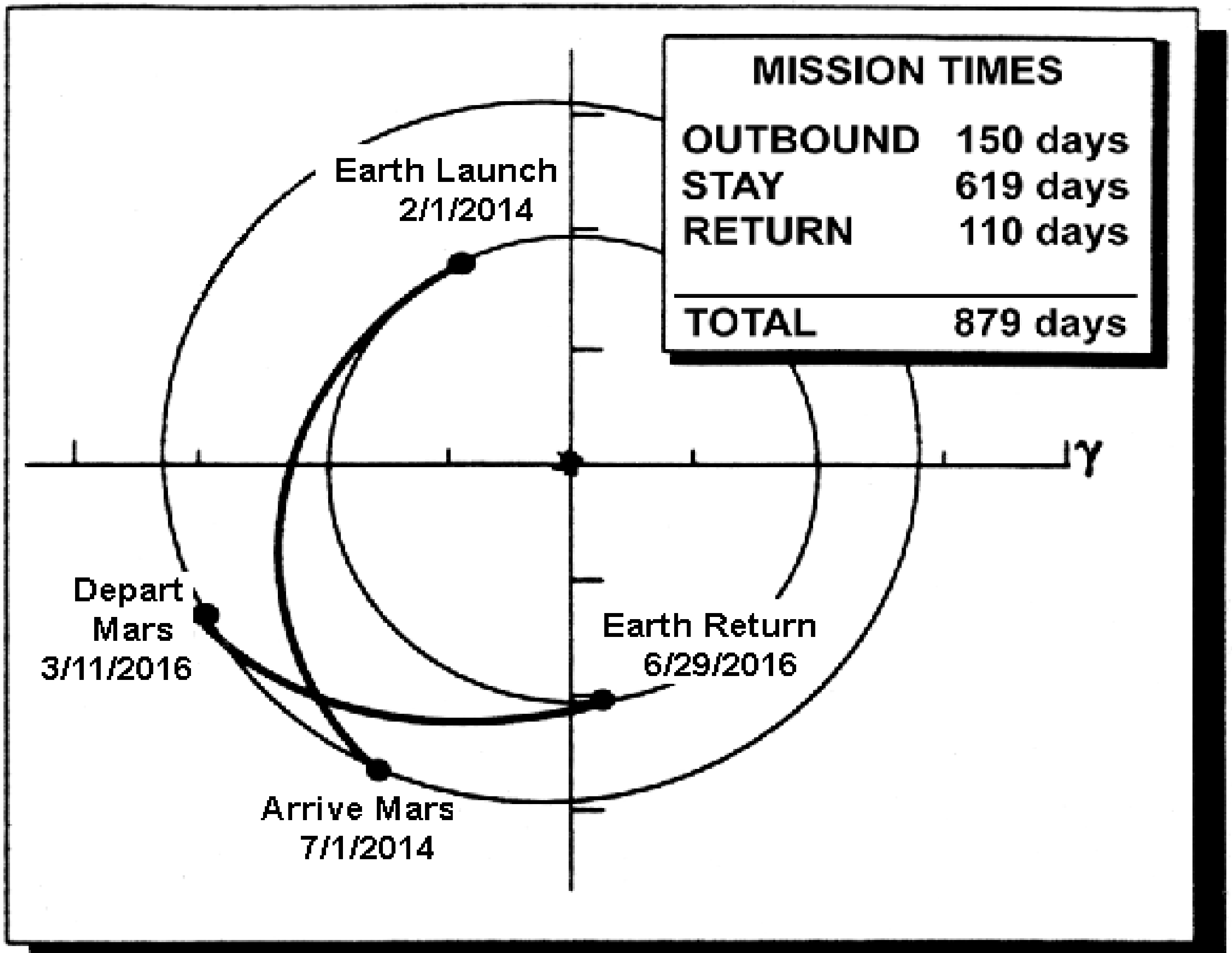
7211.5 hours or 7.2×10^3 hours

7211.5 hours X 60 minutes =

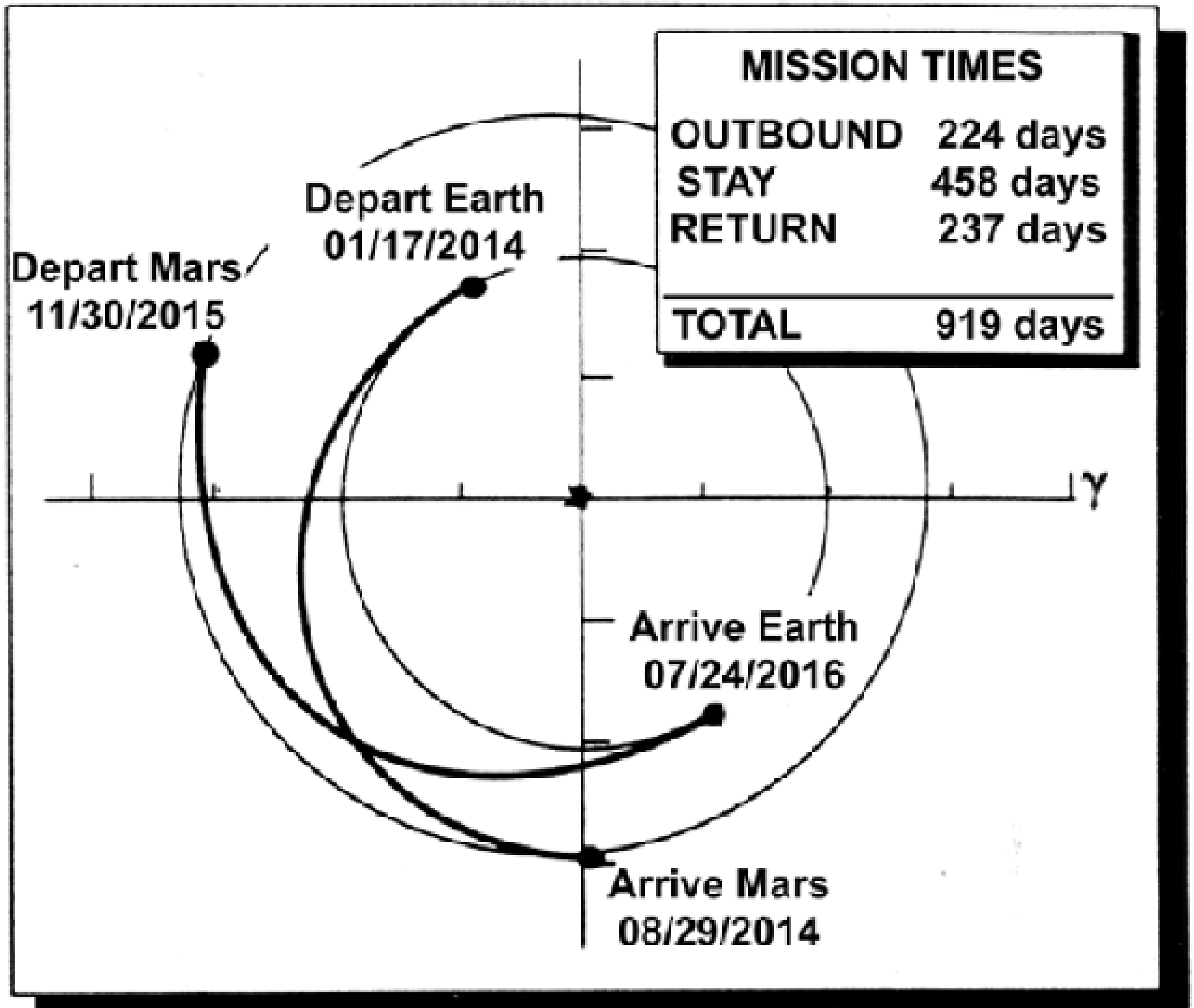
432,690 or 4.3×10^5 minutes

4.3×10^5 minutes = 10,750 class periods or 1.07×10^4 class periods

Here is one plan that will take two and a half years.



This is another mission design, again two and a half years in length.

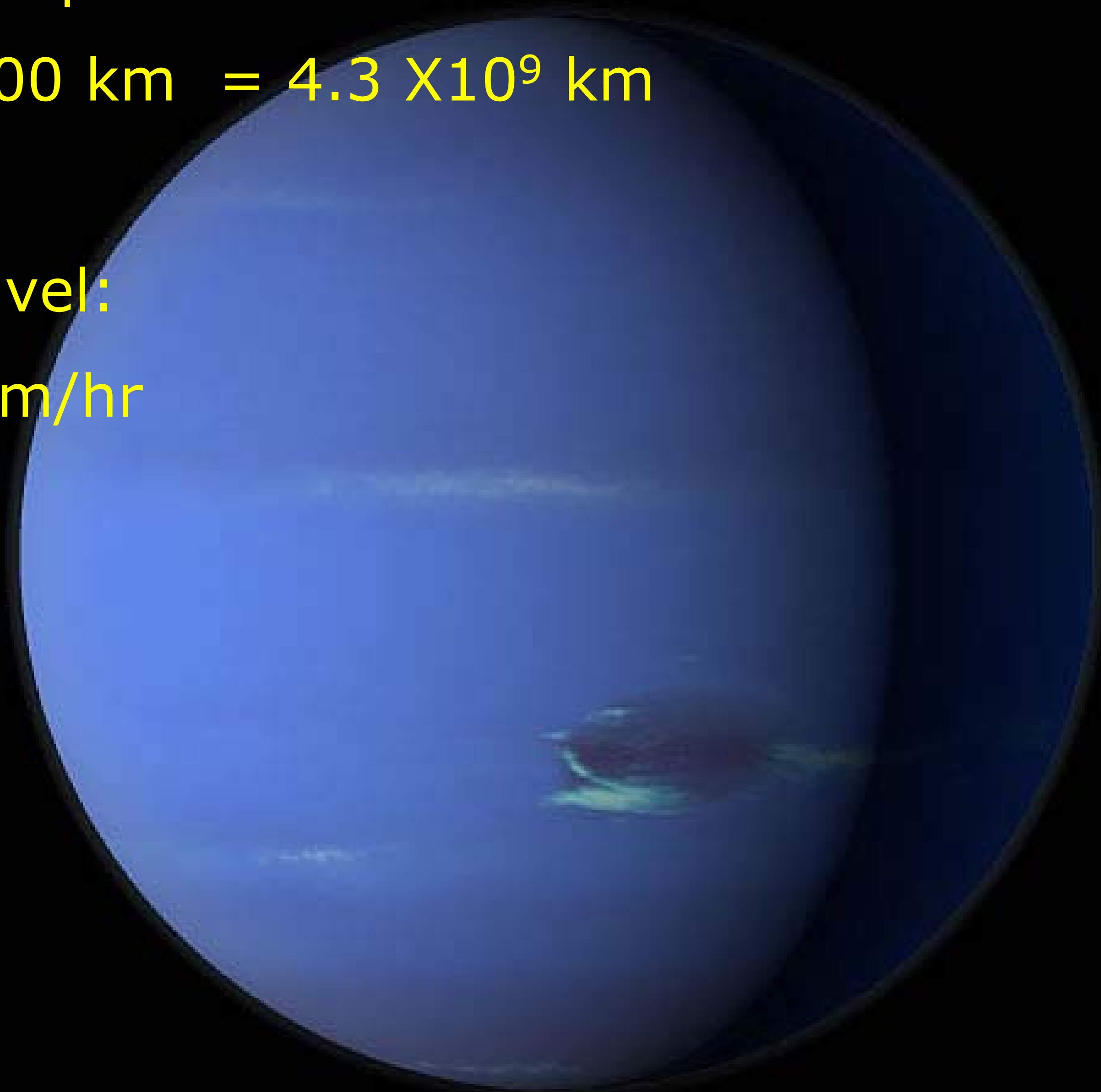


Distance to Neptune:

4,338,000,000 km = 4.3 $X 10^9$ km

Speed of Travel:

1.04 $X 10^4$ km/hr



47 years away

Alpha Centauri:

Our Closest Stellar Neighbor

4.35 light years away

Distance to Alpha Centauri:

4.35 light years from our solar system

Convert light years to distance

300,000 km/s X (60sec X 60min X 24hours X 365days X 4.35yrs)

= 4.1 X 10^{13} km

How long would it take to get to Alpha Centauri at our current travel speed?

$$\frac{4.1 \times 10^{13} \text{ km}}{1.04 \times 10^{4} \text{ km/hour}} = 3.9 \times 10^{9} \text{ hours}$$

Convert to years:

$$\frac{3.9 \times 10^{9} \text{ hours}}{24 \text{ hours/day}} = 1.6 \times 10^{8} \text{ days}$$

$$\frac{1.6 \times 10^{8} \text{ days}}{365 \text{ days}} = 4.4 \times 10^{5} \text{ years}$$

That's 440,000 years!

Which is the better scale model of the earth?

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Bowling ball

Orange

Which is the better scale model of the earth?

The peak of Mt. Everest is 8,848 m above sea level

Average peak of a crest on an orange skin is 1 mm

Bowling ball

Orange

Which is the better scale model of the earth?

Bowling ball

Orange

How tall would the peak of Mt. Everest be if the orange is the proper model?

Diameter of earth:

12,756 km

Diameter of orange:

10 cm

“Peak” of orange:

.1 cm

Solve for: peak of Mt. Everest:

X

Which is the better scale model of the earth?

$$\frac{0.1\text{cm}}{10\text{cm}} = \frac{X\text{m}}{12{,}756{,}000\text{m}}$$

X = 127560 meters!

Let's compare the actual height and the model height:

8.8×10^3 and 1.28×10^5

The orange model is off by 2 powers of ten!

Bowling ball

Orange


keith sutton

Diameter of Earth: **12,756 km**

Depth of Grand Canyon: **1.829 km**

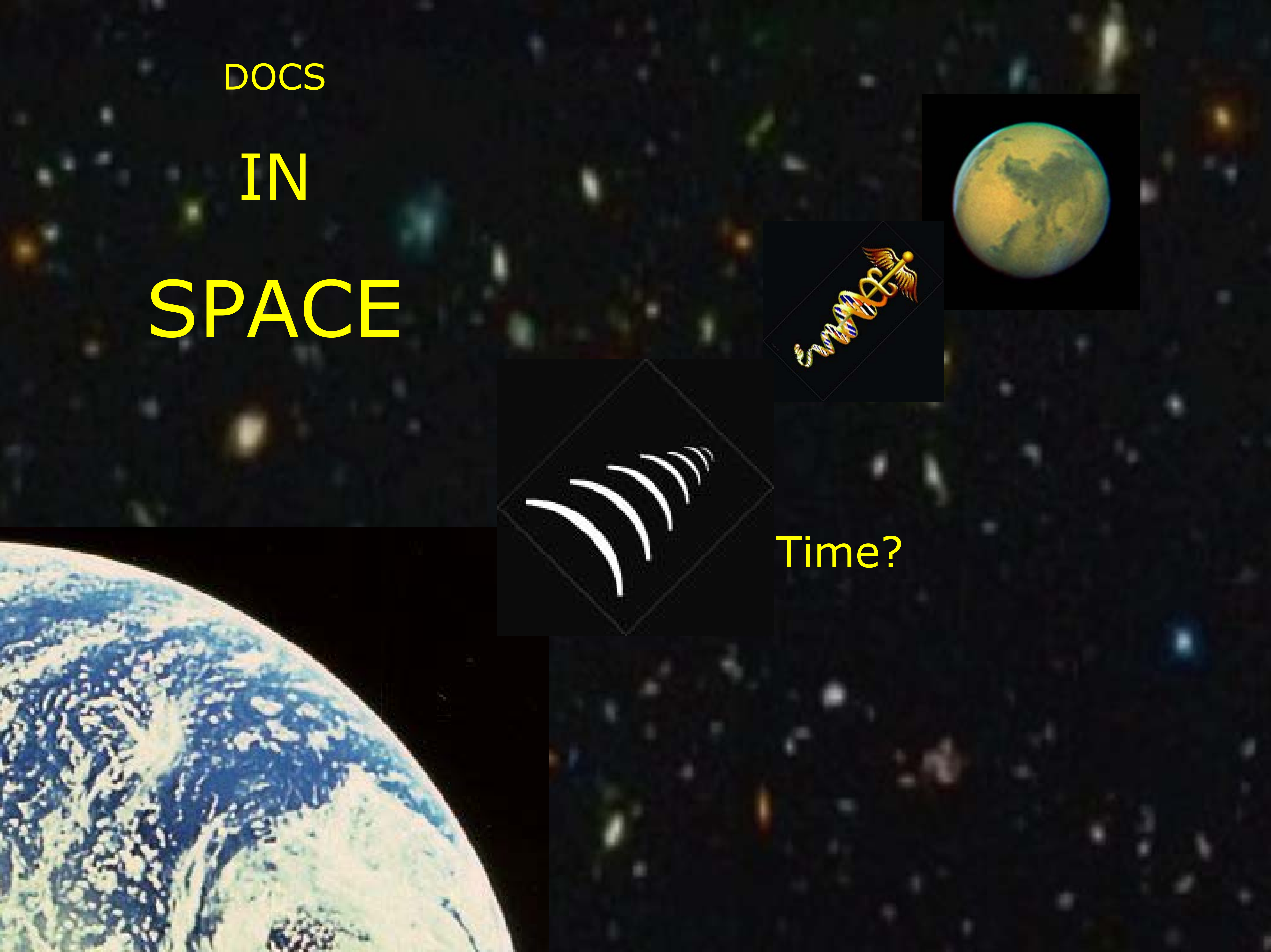
Diameter of an average bowling ball: **22.3 cm**

Depth of the Grand Canyon on our model bowling ball: **X cm**

Equation:

$$\frac{22.3 \text{ cm}}{x \text{ cm}} = \frac{12,756 \text{ km}}{1.829 \text{ km}}$$

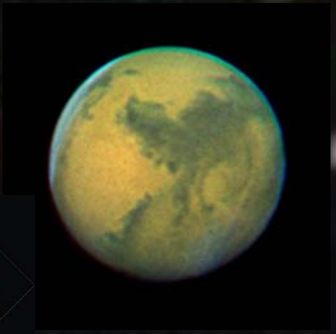
$$x = .0032 \text{ cm}$$


DOCS
IN
SPACE
Time?

DOCS

IN

SPACE



Time?

Distance between earth and Mars:
7.5×10^7 km

Speed of communication signals:
300,000 km/s (3.0×10^5 km/s)

$$\frac{7.5 \times 10^7 \text{ km}}{3.0 \times 10^5 \text{ km/s}}$$

= 250 seconds.

= approximately 4 minutes

Dangers of Prolonged Space Travel

- Bone loss
- Anosmia – loss of sense of smell due to body fluid redistribution
- Exposure to radiation
- Psychosocial stress
- Vestibular dysfunction

DEFYING GRAVITY
EMBRACING LIFE IN SPACE

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