Ig Nobel Prize 2021

For achievements that first make people LAUGH then make them THINK

BIOLOGY PRIZE [SWEDEN]:
Susanne Schötz, Robert Eklund, and Joost van de Weijer, **for analyzing variations in purring, chirping, chattering, trilling, tweedling, murmuring, meowing, moaning, squeaking, hissing, yowling, howling, growling, and other modes of cat–human communication**.

ECOLOGY PRIZE [SPAIN. IRAN]:
Leila Satari, Alba Guillén, Àngela Vidal-Verdú, and Manuel Porcar, **for using genetic analysis to identify the different species of bacteria that reside in wads of discarded chewing gum stuck on pavements in various countries**.

CHEMISTRY PRIZE [GERMANY, UK, NEW ZEALAND, GREECE, CYPRUS, AUSTRIA]:

Jörg Wicker, Nicolas Krauter, Bettina Derstroff, Christof Stönner, Efstratios Bourtsoukidis, Achim Edtbauer, Jochen Wulf, Thomas Klüpfel, Stefan Kramer, and Jonathan Williams, **for chemically analyzing the air inside movie theaters, to test whether the odors produced by an audience reliably indicate the levels of violence, sex, antisocial behavior, drug use, and bad language in the movie the audience is watching**.

ECONOMICS PRIZE [FRANCE, SWITZERLAND, AUSTRALIA, AUSTRIA, CZECH REPUBLIC, UK]:

Pavlo Blavatskyy, **for discovering that the obesity of a country's politicians may be a good indicator of that country's corruption**.

MEDICINE PRIZE [GERMANY, TURKEY, UK]:

Olcay Cem Bulut, Dare Oladokun, Burkard Lippert, and Ralph Hohenberger, **for demonstrating that sexual orgasms can be as effective as decongestant medicines at improving nasal breathing**.

PEACE PRIZE [USA]:

Ethan Beseris, Steven Naleway, and David Carrier, **for testing the hypothesis that humans evolved beards to protect themselves from punches to the face**.

PHYSICS PRIZE [THE NETHERLANDS, ITALY, TAIWAN, USA]:

Alessandro Corbetta, Jasper Meeusen, Chung-min Lee, Roberto Benzi, and Federico Toschi, **for conducting experiments to learn why pedestrians do not constantly collide with other pedestrians**.

KINETICS PRIZE [JAPAN, SWITZERLAND, ITALY]:

Hisashi Murakami, Claudio Feliciani, Yuta Nishiyama, and Katsuhiro Nishinari, **for conducting experiments to learn why pedestrians do sometimes collide with other pedestrians**.

ENTOMOLOGY PRIZE [USA]:

John Mulrennan, Jr., Roger Grothaus, Charles Hammond, and Jay Lamdin, **for their research study "A New Method of Cockroach Control on Submarines"**.

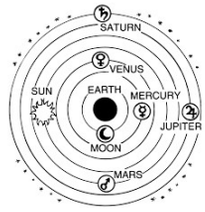
TRANSPORTATION PRIZE [NAMIBIA, SOUTH AFRICA, TANZANIA, ZIMBABWE, BRAZIL, UK, USA]:

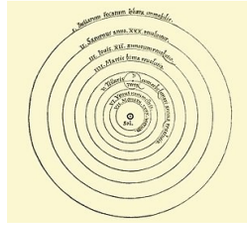
Robin Radcliffe, Mark Jago, Peter Morkel, Estelle Morkel, Pierre du Preez, Piet Beytell, Birgit Kotting, Bakker Manuel, Jan Hendrik du Preez, Michele Miller, Julia Felippe, Stephen Parry, and Robin Gleed, **for determining by experiment whether it is safer to transport an airborne rhinoceros upside-down.**

Brief History of Astronomy

Read Handout and Pages 574-576 of text

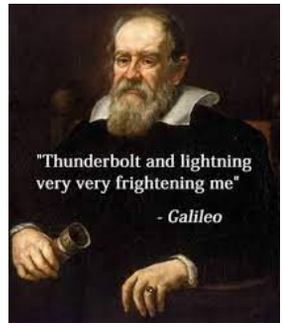
Geocentrism

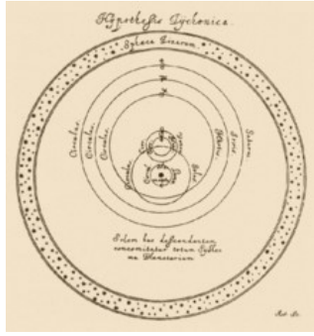




Copernicus

Galileo



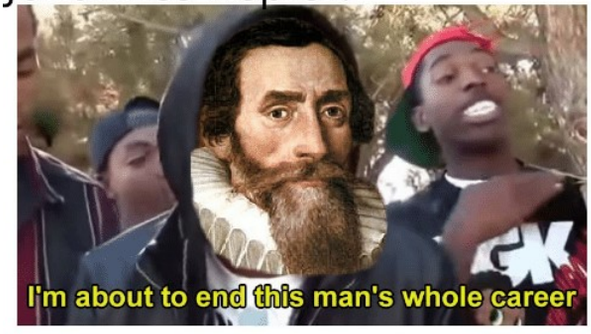


Brahe

Tycho Brahe: Hey Kepler I have the most accurate data on the solar system available can you use it to prove my theory that the sun revolves around the earth but the planets revolve around the sun?

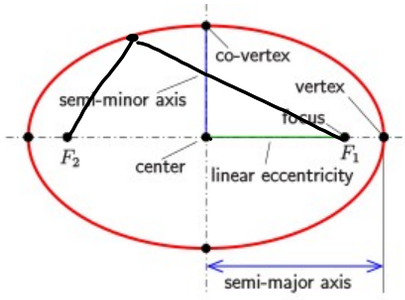
Johannes Kepler:

Kepler



This fool

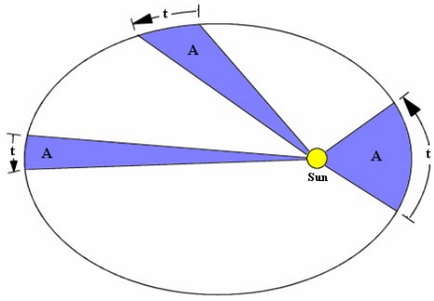
Kepler's 3 Laws of Motion



1st Law:

All planets orbit the sun in an elliptical (not circular) path. The sun is located at one of the focus points

Significance: It supported the Heliocentric system. It proposed that planets orbit the sun in elliptical paths which opposed the common belief that everything orbited the Earth in perfect circles.

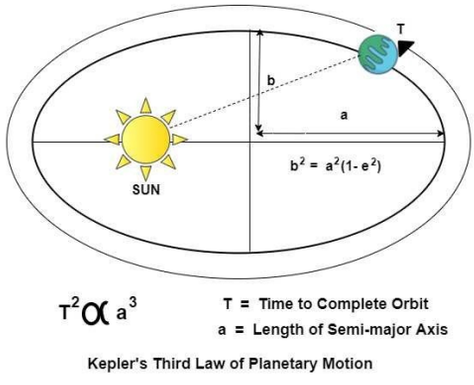


2nd Law:

A line drawn from the sun to the planet sweeps out equal areas during equal time intervals

Significance: The speed of a planet varies depending on where the planet is in its orbit. A planet (satellite) moves faster when closer to the Sun and slower when it's farther from the Sun. It also opposed the common belief that the planets orbited as constant speed

$$A_1=A_2=A_3 \qquad t_1=t_2=t_3$$



3rd Law:

The ratio of the average orbital radius cubed to the orbital period squared is a constant for all planets orbiting the sun

Significance: It links the astronomical data to Newton's Law of Universal Gravitation.

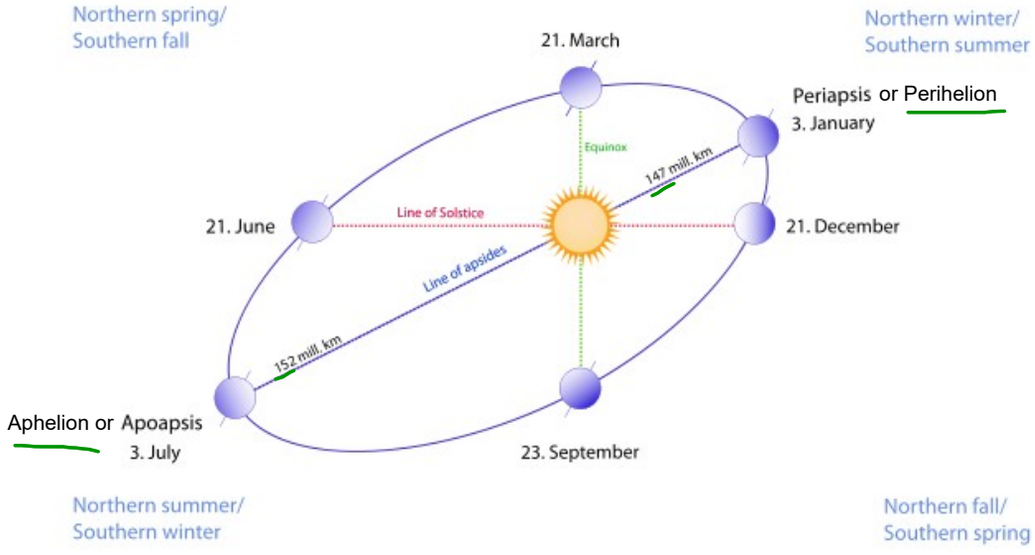
$$r^3/T^2=k_{sun}$$

Earth around Sun:

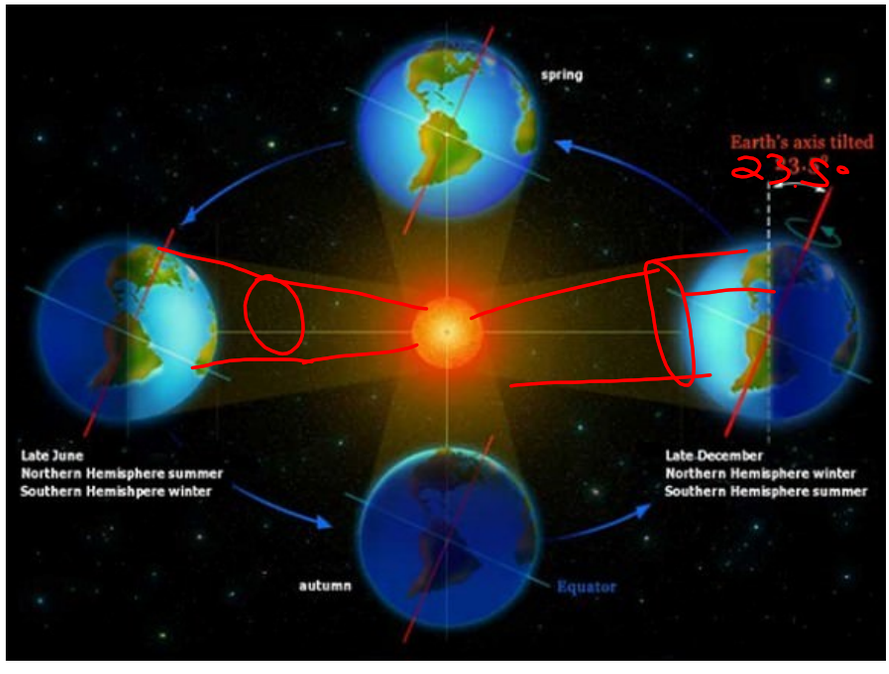
1 orbit = 365 days 5h 48 min and 46 s

Leap year every 4 year except every 100 year unless it 400 year

https://en.wikipedia.org/wiki/Earth%27s_orbit



https://www.universetoday.com/61202/earths-orbit-around-the-sun/



Law Three

Data from different sources varies so references were included below the following table. (4~5 sig figs)

Name	Average radius (m)	Mass (kg)	Mean Orbital Radius (m)	Period(days)	Orbital radius (AU)	Period (years)
Sun	696.0×10^6	1.991×10^{30}				
Mercury	2.43×10^6	3.2×10^{23}	5.80×10^{10}	87.77	0.388	
Venus	6.073×10^6	4.88×10^{24}	1.081×10^{11}	224.70 ÷365	0.723	0.615
Earth	6.3713×10^6	5.979×10^{24}	1.4957×10^{11}	365.25	1.000	1.000
Mars	3.38×10^6	6.42×10^{23}	2.278×10^{11}	686.98		
Jupiter	69.8×10^6	1.901×10^{27}	7.781×10^{11}	4332.62		
Saturn	58.2×10^6	5.68×10^{26}	1.427×10^{12}	10759.20		
Uranus	23.5×10^6	8.68×10^{25}	2.870×10^{12}	30685		
Neptune	22.7×10^6	1.03×10^{26}	4.500×10^{12}			
Pluto	1.15×10^6	1.2×10^{22}	5.9×10^{12}			

$$AU = \frac{r_{Body}}{r_{Earth}}$$

Q1. Use the data for Earth and Mars to illustrate Kepler's third law.

Q2. Use the data in the table to find the period of Neptune (referenced to Earth).

Q3. Use the data in the table to find the period of Pluto (referenced to the Earth).

Q4. Complete the AU and year columns in the table for the remaining planets.

AU = astronomical unit

$$\text{ratio} = \frac{r_{body}}{r_{Earth}} \qquad \text{ratio} = \frac{T_{body}}{T_{Earth}}$$