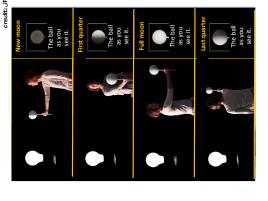
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Paris Observatory





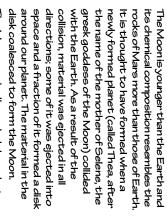
The Universe in my Pocket



An experiment to understand the phases of the Moon

## The origin of the Moon

Artistic vision of Earth's



The Moon is thought to have formed

Theia.

formed planet called collision with a newly

shortly after the formation of the Earth

Credit: Wikipedia

agram of the formation of the Moon.

mage of the Moon taken on January 21,

2019. The arrow

location of an shows the

flowed to the surface, producing the its interior was still molten, and lava The Moon gradually cooled down, but

craters that are still visible today. asteroids and comets which formed Moon was continually bombarded by During its first 600 million years, the

the surface on meteoroid striking caused by a impact flash

this date.

redit: J.M. Madiedo

Moon dust will be used to grow crops in unar greenhouses and to manufacture equipment with 3D printers.

covered with very fine, scratchy dust, dispersed some of the dust, causing them respiratory and eye problems. When the first astronauts went to and it was difficult to clean them. the Moon, their space suits were Astronauts used brushes which vacuum cleaners for their suits. Future explorers will carry dust

greenhouses, where plants will not only it is frozen. In the future, robots will be provide fresh food, but also generate near the poles where no sunlight falls the bottom of craters and crevaces There is little water on the Moon. At used to transport this water to oxygen for breathing and fuel.

Future stays on the Moon

eclipses, the Moon takes on a dark orange color. During lunar

han when it is at a nust pass is greater hrough which the eflected sunlight igher elevation. atmosphere

edit NASA

ause the thickness of the Earth's through orange and red light. The Moon looks disperses blue and green light and only lets slightly orange when it is close to the he dust suspended in the atmosphere Credit NASA

The dark rocks on the Moon resemble terrestrial volcanic rocks.

elevations, rich in calcium Moon are hardened lava flows. The lighter areas The gray areas of the and aluminum. are the higher

# what is needed using lunar materials.

expensive. A better approach would be to make long-term missions to the Moon would be very

Transporting everything needed to sustain



(ESA) prototype

variations. meteorids, gamma radiation and temperature 3D printer, would protect astronauts from The shell, built from lunar soil by robots using a

ways to grow food using lunar soil mixed different research groups are testing To produce food for astronauts (Open Agriculture, 2019) fertilizers. with bacteria and



### The color of the Moon

calcium and aluminum, and reflect the resemble lava from volcanoes. The rocks brought back by the astronauts the light of the Sun. It has grey areas most sunlight. highest in elevation; they are rich in lighter areas of the Moon are the that are hardened lava flows. The Moon The Moon shines because it reflects

only lets through the yellow, orange and blue and green light from the Sun and dust in our atmosphere disperses the during lunar eclipses. This is because the When the Moon is close to the horizon time before finally reaching us on the through the atmosphere a second Moon, and then the reflected light goes Earth's atmosphere on its way to the passes through the Earth's shadow. red light. During eclipses, the Moon it appears orange - and even more so The sunlight first travels through

+

0

pole.

(NASA/JPL/USGS)

a view of the

Moon's surface. The image shows Moon's south

the Moon create craters. Since there is

no atmosphere, there are no winds to blow the dust away, nor is there liquid

water to destroy the craters as

happens on Earth.

Asteroids and meteoroids that strike

molecules. That is why the Moon has no

atmosphere.

gravity, it cannot retain any gas

Because the Moon has such a weak

on the Earth!

him would be 6 times less intense than

because the force of gravity acting on

would weigh 10 pounds on the Moon, A child weighing 60 pounds on Earth

The ancient Greeks first estimated the measurements give 1737 km, which is radius of the Moon about 2200 years about a quarter of the Earth's radius. ago (see TUIMP 15). Current

object depends on its immediate visual zenith is surrounded by large expanses the horizon, nearby objects are seen in the horizon than when it is high in the Moon looks bigger when it is close to environment. When the Moon is near appear larger, while the Moon at the sky. This effect is called "the Moon The way we perceive the size of an of empty sky that make it appear fine detail, which makes the Moon Ilusion" and has been known since ancient times. smaller.



## on the moon (NASA, 1972).

### The size of the Moon

You have probably noticed that the



The phases of the from Earth. Note its illuminated different shapes of Moon are the parts when seen

*flews of the Moon's phases.* see the same face of the Moor thatwe always

phases of the Moon (see pages 15 and 16). You can do a home expo nt to understand the

pole (North or South) or to the Earth's depending on whether you are closer to the The crescent Moon has a different tilt

Credit: Ainsley Dennett Kingdom) Isle of Wight (United Crescent moon on the pole (latitude +51°): Closer to the North

rescent moon in the (latitude-23°) Sloser to the equator

(Brazil) city of São Paulo ardo Motti

> Put a lamp in a dark room. Take a ping-pong ball, poke a hole in it with a pencil and hold the pencil vertically with the ball on top.

### you are the Earth. The lamp is the Sun, the ball is the Moon and

raising it high enough so that you can see the lamp as well. The lamp illuminates the far side From Earth, the new moon is not visible. of the Moon. This phase is called the new moon Face the light and hold the ball in front of you,

phase is called the first quarter. Tum to the left so that your moon and body The right half of the ball is now illuminated. This are now perpendicular to their original position

is fully illuminated. This is the full moon. your moon is directly opposite the Sun, as seen from Earth. The half as seen from Earth Make another quarter turn to the left. Now

illuminated. This is the waning quarter Make a quarter turn to the left again. The side opposite the first quarter moon is now



## The Universe in my pocket No.

Institute in Morelia (Mexico). from the UNAM Radio Astronomy Paris Observatory and revised by Stan Kurtz UNAM, Mexico and Grażyna Stasińska of the Julieta Fierro of the Institute of Astronomy, This booklet was written in 2022 by

NASA. Credit: Vovan (Ukraine) Elements of this image were provided by background reflected in the sea. Cover image: The Moon on a starry sky



collection and the topics To learn more about this visit http://www.tuimp.org presented in this booklet

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celestial ball". A photo by Laurent Laveder 'Playing with the

More than 2

million craters with diameters greaterthan 1 km have been identified on the





'walk" but rather "jump". This is because nave probably noticed that they do not

the gravitational pull of the Moon is

much smaller than Earth's.

astronauts walking on the Moon, you

fyou have seen photosorvideos of *Gravity of the Moon* 

> roads it also looks bigger. It above narrow streets or When we see the Moon

is an optical illusion.

In the figure above the orange circles have the same diameter. On the right, the images of the



the sizes of nearby objects. Objects appear to have

different sizes depending on

appearance throughout the month? Have you noticed that the Moon changes The phases of the Moon

Sometimes it looks round like a ball and

day side. System have their night side and their other times more as a smile. All planets and satellites in the Solar

as its twilight line. When the Moon's the Sun is shining on it from the side. see only half of it illuminated, it is because is facing it. On the otherhand, when we shape looks round, it is because the Sur of the Moon's days and nights, as well From Earth we can see the succession

time in 1959 by a Soviet probe was photographed for the first synchronized. The far side of the Moon translation around the Earth are rotation about itself and its face of the Moon because the Moon's From Earth we always see the same

