

An illustration of a person with white hair, wearing a teal jacket and blue pants, standing on the surface of the moon. The person is holding a long-handled tool, possibly a shovel or a probe. To the right of the person is a small, simple house with a grey roof, a red door, and a yellow window. The moon's surface is depicted with various shades of grey and white, showing craters and lunar maria. The background is a dark blue night sky filled with numerous white stars of varying sizes.

Living on the Moon

By Inès, Rafael, Ethan, Quentin

1/ Atmosphere on the moon

- Humans need to breath
- ★ Humans need to drink and to eat
- Humans need to talk and to ear

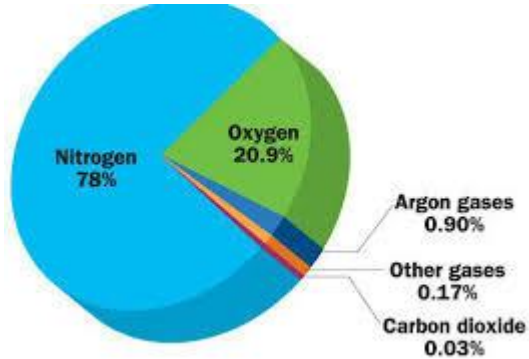
2/ Gravitation on the moon

- Humans need to walk
- Humans need to have activities





To breath on the moon : the atmosphere



oxygen :

- 21% of the air on earth

=> role :

- It plays a vital role in the breathing processes
- It helps the functioning of the brain

	Mars	Venus	Earth
Weight	0.107	0.815	1.000
density	3.94	5.25	5.52
Distance to the sun (millions of km)	228	108	149.6
nitrogen (%)	2.7	3.5	78
Oxygen (%)	0.15	0.003	21
Ar (%)	1.6	0.006	0.9
Pressure	10 ³ Pa	101 325 x 10 ² Pa	101 325 Pa

To breath on the moon : the atmosphere



moon atmosphere :

very thin layer of gases on the lunar surface

=> exosphere :

- Radioactive isotopes of radon and polonium found by the Lunar Prospector
- A very little quantity of oxygen detected



- **Moon atmosphere** : 100 molecules per cubic centimeter
- **Earth atmosphere**: 100 billions of billion molecules per cubic centimeter.





Eating and drinking on the moon

Element	Percent by mass
<u>Oxygen</u> (O)	65
<u>Carbon</u> (C)	18
<u>Hydrogen</u> (H)	10
<u>Nitrogen</u> (N)	3
<u>Calcium</u> (Ca)	1.5
<u>Phosphorus</u> (P)	1.2
<u>Potassium</u> (K)	0.2
<u>Sulfur</u> (S)	0.2
<u>Chlorine</u> (Cl)	0.2
<u>Sodium</u> (Na)	0.1
<u>Magnesium</u> (Mg)	0.05
<u>Iron</u> (Fe), <u>Cobalt</u> (Co), <u>Zinc</u> (Zn), <u>Iodine</u> (I)	<0.05 each
<u>Selenium</u> (Se), <u>Fluorine</u> (F)	<0.05 each

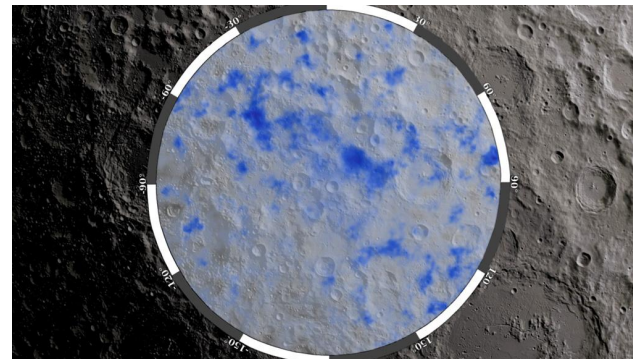
Food : role of oxygen and moon resources

- Oxygen helps the circulation of the nutrients inside the human system.
- The aliment resources are non-existent on the moon



Water on the moon :

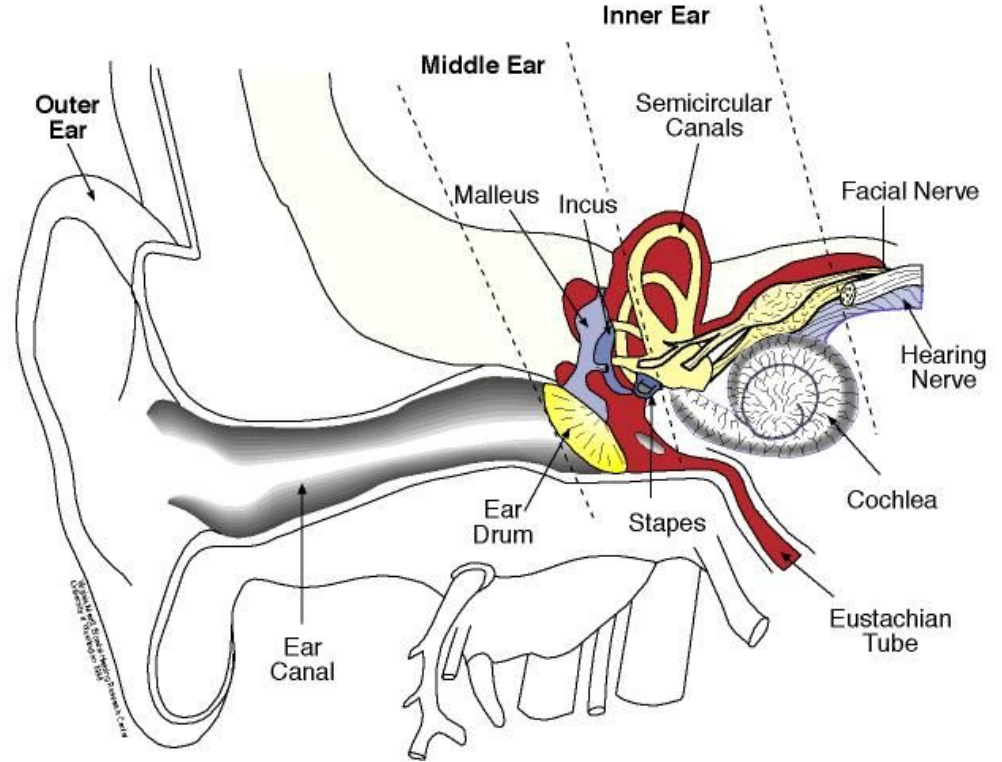
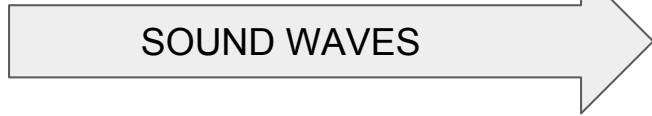
- NASA found water on the moon





To have social interactions on the moon

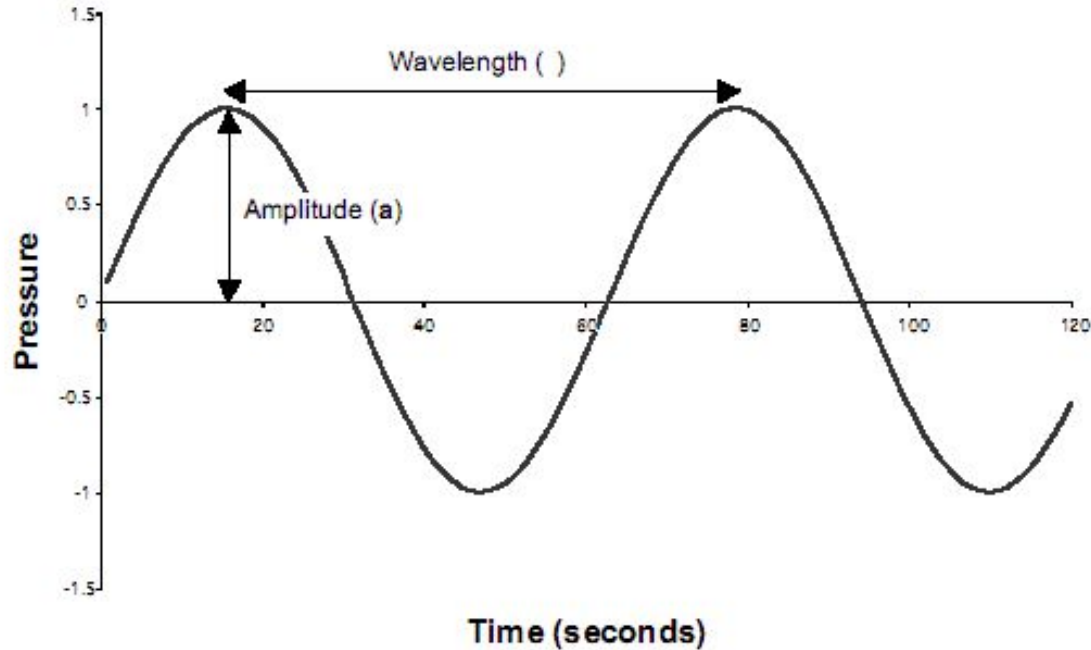
How does the ear work ?



- main task of the ear is to detect, transmit and traduce the sound



To have social interactions on the moon



- A sinusoidal function to represent a wave
- A sound wave needs a medium to propagate
- A mechanical wave



To have social interactions on the moon

How does the sound, a mechanical wave propagate ?

Relationship of Newton:

$$c = \sqrt{\left(\frac{\partial p}{\partial \rho}\right)_s},$$

where

- p is the pressure in Pascal Pa
- ρ is the density in Kg.m-3
- s the temperature in Kelvin K

- In the vacuum, there is **no pressure**
- Pressure corresponds to **the force** per unit area that a fluid or a solid exerts on it.
- We need to create actually a **medium** where we can breath to hear

To have social interactions on the moon





Gravitation on the moon

Humans need to walk so they must have both feet on the ground. This is possible because of gravitation.

$$F = G \left(\frac{m_1 m_2}{r^2} \right)$$

F = gravitational force between two objects

m₁ = mass of first object in kilograms

m₂ = mass of second object in kilograms

r = distance between objects

G = Gravitational constant

$$P = m \times g$$

P is the weight in Newton

m is the mass in kilograms

g is constant in Newton/ Kilograms

Example of a man on the moon (80 kg):

$$F = 6.67 \times 10^{-11} \times \frac{(7.3 \times 10^{22}) \times 80}{(1.74 \times 10^6)^2}$$

$$F = 1.3 \times 10^2 \text{ N}$$

$$P = 1.3 \times 10^2 \text{ N}$$

$$P = 80 \times g_{\text{moon}}$$

$$g_{\text{moon}} = \frac{1.3 \times 10^2}{80}$$

$$g_{\text{moon}} = 1.6 \text{ N/Kg}$$

$$g_{\text{earth}} \approx 6 \times g_{\text{moon}}$$

Walk on the moon



- *6 times heavier than if we were on the earth*
- *less attracted by the ground*

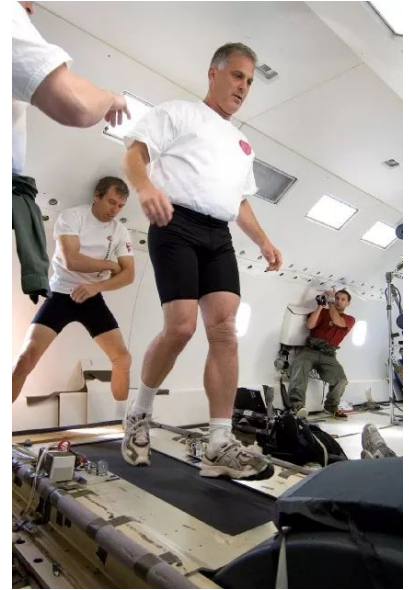
Can we run faster on the moon ?

*Nasa experience in a plane which reduce its internal gravity to lunar level
8 subjects ran on a treadmill inside of this plane*

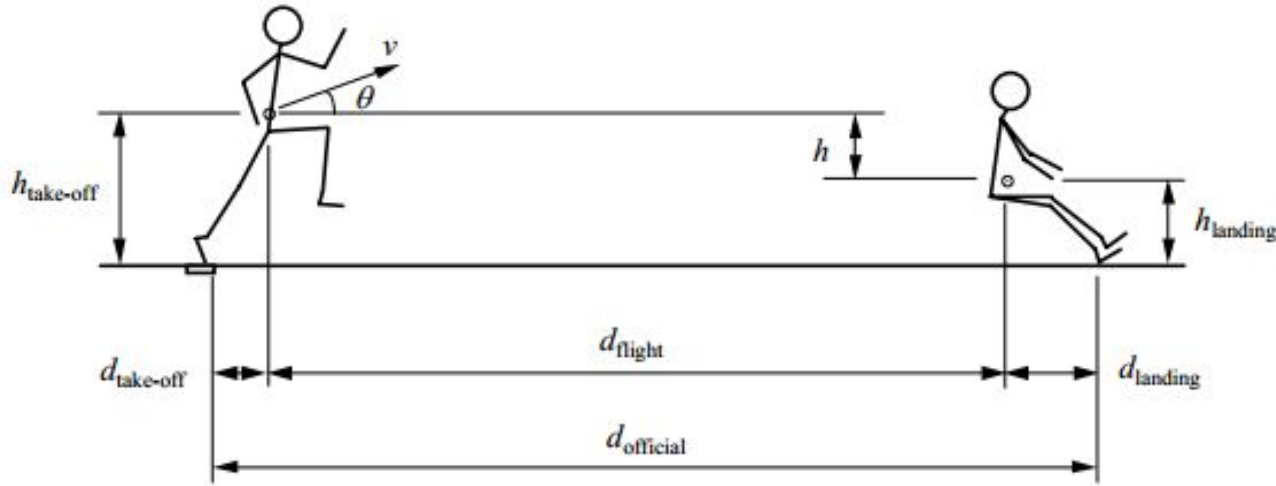
According to the Nasa theoretical calculations, the average walk-to-run transition speed was about 1.8 miles per hour

In real life it was about 3.13 miles per hour

The forces generated by the swinging movement of the runners' arms and legs gave them a boost which is too small to notice on the earth.



If I want to practice long jump, can I break the world record established on Earth?

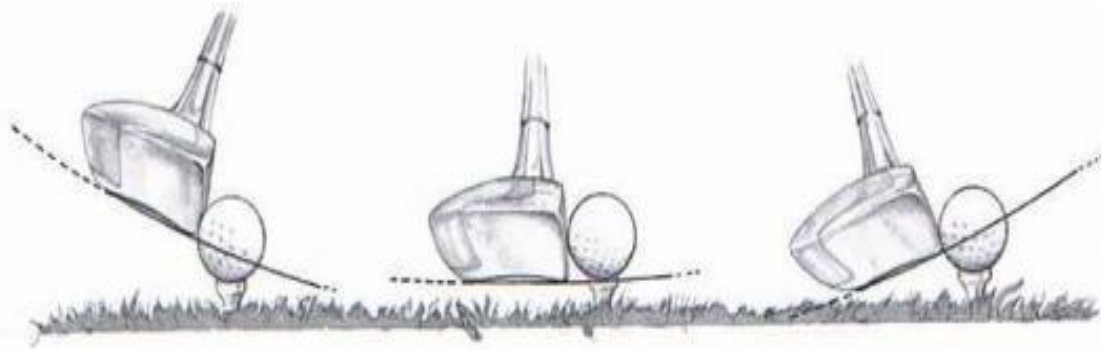


$$d_{\text{flight}} = \frac{v^2 \sin 2\theta}{2g} \left[1 + \left(1 + \frac{2gh}{v^2 \sin^2 \theta} \right)^{1/2} \right]$$



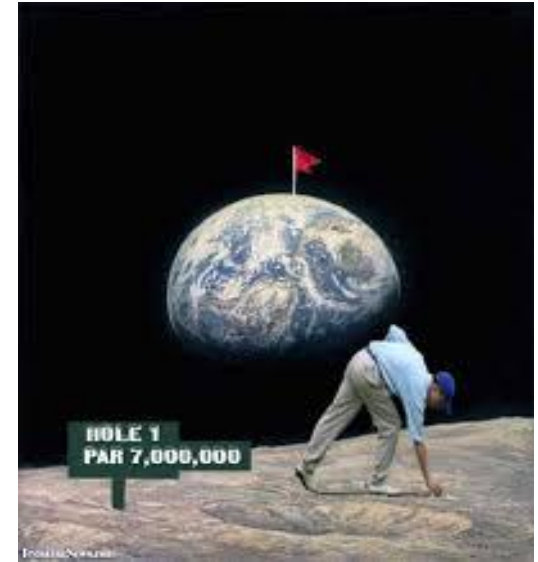
22.05m !!

How far can I hit a golf ball on the Moon?



$$V_{\text{ball}} = V_{\text{clubhead}} \times \left[\frac{2}{1 + m/M} \right]$$

$$S = \frac{2v_i^2 \sin\theta \cos\theta}{g} = 2806\text{m} !!$$



Conclusion

Difficulties to live on the moon:

- No Atmosphere
- No food
- No sounds or strange sounds...
- Not the same gravitation
- No golf field...

But may be possible...

Bibliography

- <https://www.nasa.gov>
- <http://www.mars-one.fr/objectifs-projet/>
- jwbales.us
- math.tutorvista.com
- www.physicsclassroom.com
- www.khanacademy.org