Gravity

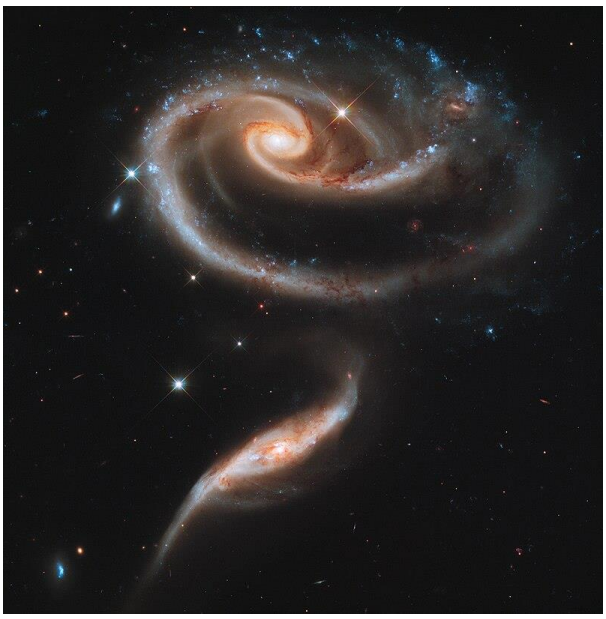

Image: The shape of two massive galaxies in the picture are distorted due to gravity.
Autor: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)
https://en.wikipedia.org/wiki/Gravity#/media/File:UGC_1810_and_UGC_1813_in_Arp_273_(captured_by_the_Hubble_Space_Telescope).jpg

Gravity (mass attraction) is one of the four known fundamental forces of physics, along with the strong and weak interactions and the electromagnetic force. While the two interactions only have a limited range at the atomic level, electromagnetism and gravity act on an infinite scale. The gravitational force is by far the weakest fundamental force. It is around 40 orders of magnitude smaller than the electromagnetic force. However, gravity is the driving force in the universe. It keeps the planets on their orbits, the galaxies together and is responsible for the large structures in the universe, such as the galaxy clusters. It is also the dominant force behind the structure of our solar system.
Gravity was first postulated and theoretically substantiated by Newton. With the law of gravity, Newton described the relationship between two bodies based on gravitational forces. According to this, the strength of gravity depends on the mass and distance of the bodies.

Gravity force: $F_G = G * m_1 * m_2 / r^2$,

where m_1 and m_2 are the masses of the two bodies and r is the distance between the two bodies. G denotes the gravitational constant, which is $6.67430*10^{-11}$ $m^3/(kg*s^2)$. It is important to note that the forces of attraction exerted by both bodies are equal. One body attracts the other body with the same force as vice versa.
The theory of gravity was significantly expanded by Albert Einstein. In his general theory of relativity, he extended the theory with the following postulates:

- the effect of gravity occurs at the speed of light
- gravity is interpreted as the curvature of four-dimensional space

- in addition to mass, energy also acts as gravity, so that gravity itself also influences gravity
- There are gravitational waves that transmit changes in gravity (similar to light)
- The mass of bodies changes with increasing speed (results from the special theory of relativity).

Until now, electromagnetic radiation (radio waves, microwaves, infrared, light, ultraviolet, X-rays and cosmic radiation) in all its diversity has been the most important parameter for determining the properties of objects and structures. Gravitation was used more to make statements about movements and the like. With the first measurement of gravitational waves, the range of possibilities has expanded significantly.

Gravity is not part of the so-called standard model of physics. To do so, gravity would have to be described as quantum gravity, which has not yet been achieved. Black holes would then perhaps be describable.

Link: https://en.wikipedia.org/wiki/Gravity
Link: https://en.wikipedia.org/wiki/Alternatives_to_general_relativity