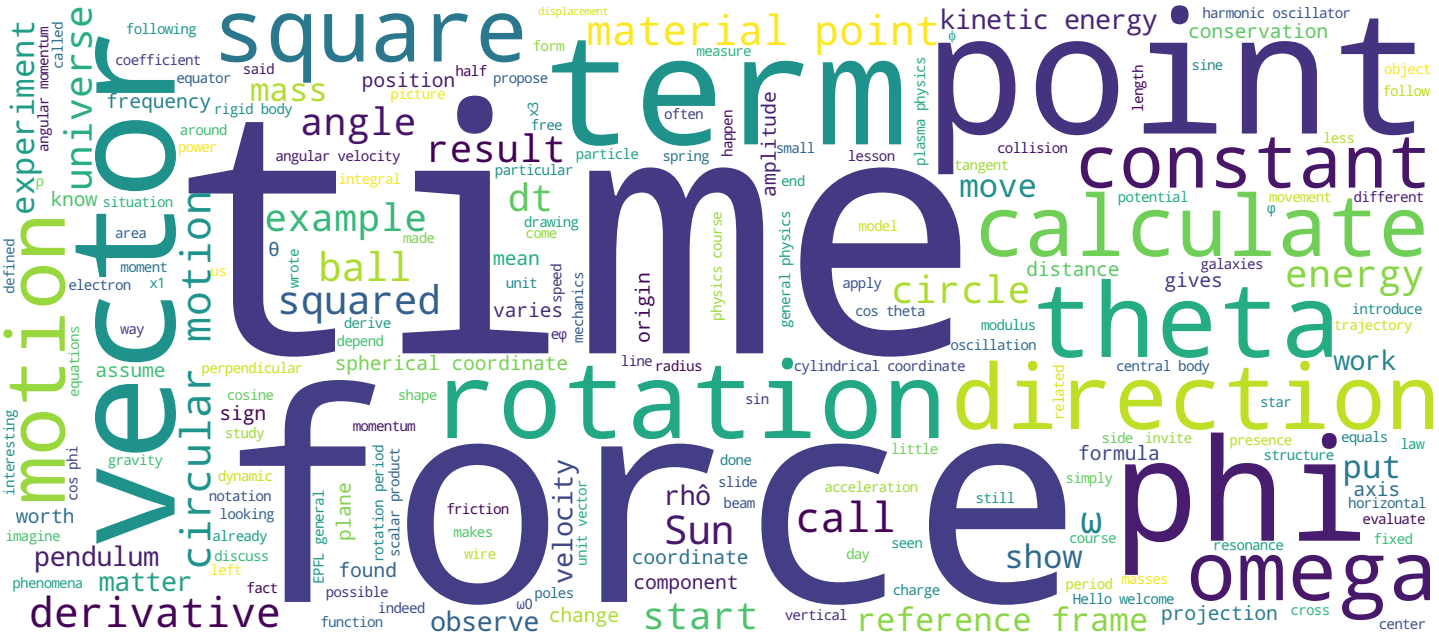
Le mouvement circulaire, un regard sur l'univers

Mécanique, cours 8

Paolo Ricci



Video

EPFL

Le mouvement circulaire, un regard sur l'univers

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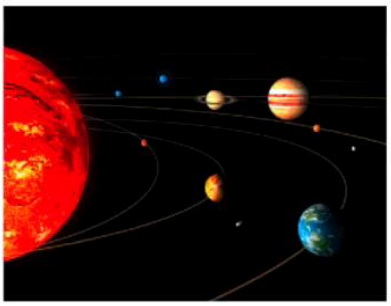
Hello, my name is Paolo Ricci, I am a professor in theoretical plasma physics at the Plasma Physics Research Center of the EPFL. I would like to discuss with you about circular motion.

Notes

Summary

0m 04s

Le mouvement circulaire, un regard sur l'univers



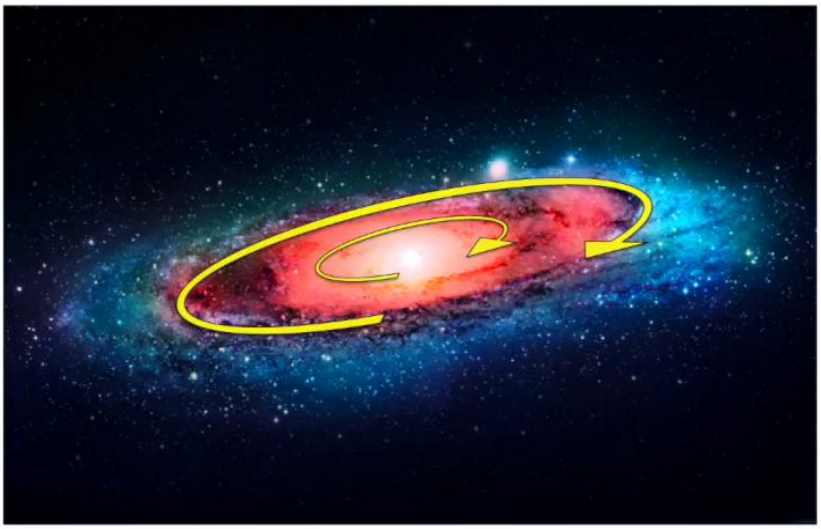
Indeed there is a motion which characterizes the universe. It is the circular motion. To give some examples close to us, the Earth rotates on itself in 24 hours, and this movement is the basis of the alternation between day and night. The Earth also makes a circular motion around the Sun, which is responsible for the seasons. At the same time, the Sun, like all stars, rotates around the centre of the galaxy.

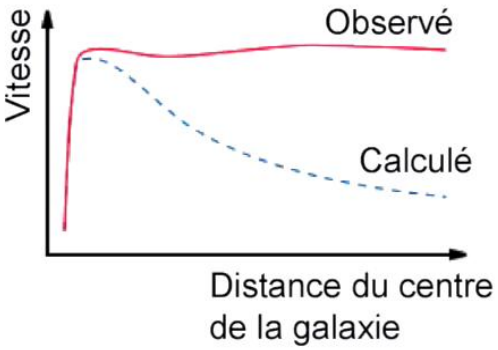
Notes

Summary

0m 17s

La rotation des galaxies





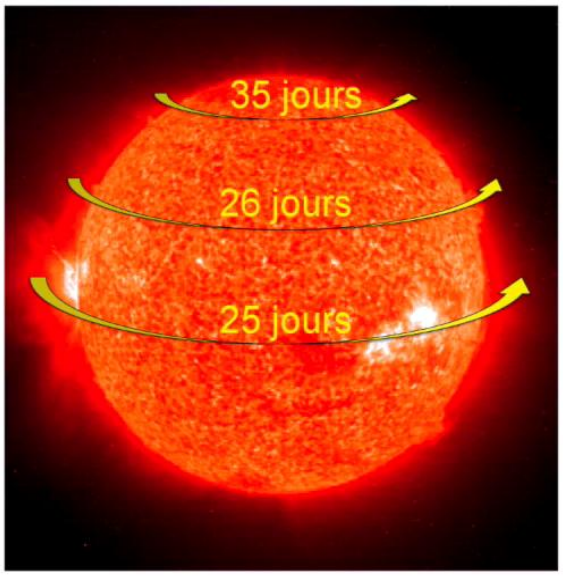
The study of the universe is also done through the study of circular motion. For example, it was said that stars revolve around the center of their galaxy. Observations allow us to evaluate the rotation speed of stars and compare it with theoretical predictions. These predictions can be made by knowing the mass inside the galaxies, which can be estimated by looking at their luminosity. The result of these comparisons is very interesting. There is some matter missing to be able to explain the rotation of stars. It is currently thought that this difference betrays the presence of dark matter which penetrates the galaxies.

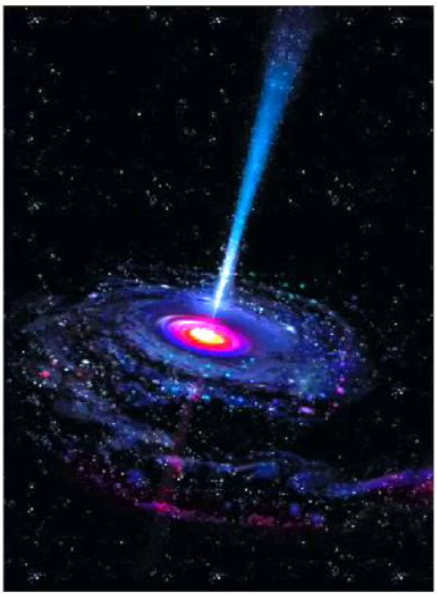
Notes

Summary

0m 50s

La rotation solaire et les disques d'accrétion





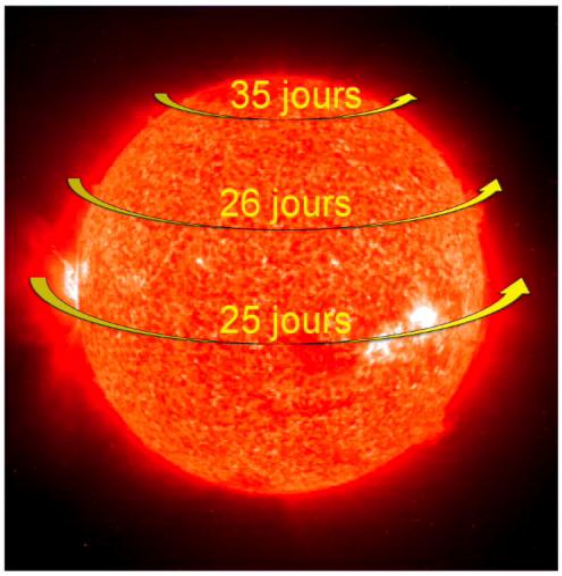
I would now like to focus your attention on two examples of rotation in the universe, which are at the origin of questions still very open in physics. These two motions are apparently very different but in reality they result from the same phenomena. The first of these movements is linked to the rotation of the Sun. Thanks to the presence of sunspots, it is possible to follow the rotation of the sun's surface and to evaluate its rotation period. It is found that the rotation of the sun is not that of a rigid body. On the contrary, the rotation period depends on the latitude; it is 25 days at the equator and 35 days at the poles. With more sophisticated techniques, it is also possible to measure the rotation inside the Sun. The result is surprising. The interior of the Sun rotates like a rigid body, with an angular speed, between that of the poles and that of the equator. The origin of this type of rotation is still a mystery. A second example of rotation that we observe in the universe, is that of the accretion disc. This is a structure formed by matter orbiting a celestial object. This central body is typically a young star, a protostar, a white dwarf, a neutron star or a black hole.

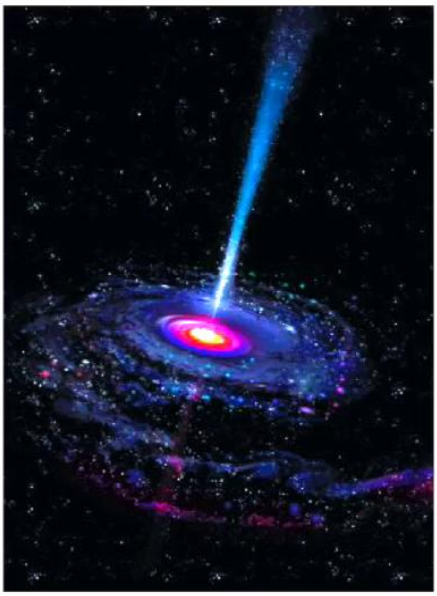
Notes

Summary

1m 34s

La rotation solaire et les disques d'accrétion



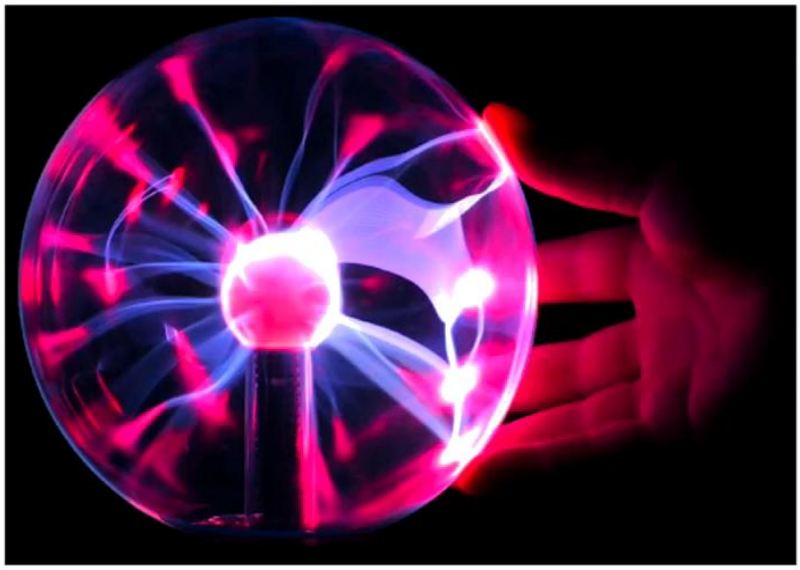


The shape of the structure is generated by the action of the gravitational force, which attracts the matter towards the central body, and the circular motion of the particles. The whole mechanism is not yet totally clear but we know that the matter is dragged in spirals towards the central body, and a great dissipation of energy takes place. This dissipation is visible by the beams of matter which are emitted at a speed close to that of light, perpendicularly to the disc. The origin of these jets is one of the most important open phenomena in astrophysics. In conclusion, these two examples illustrate two circular motions in the universe on which research is very active. They arise from the same phenomena that are related to the dynamics of matter in the Sun and in the accretion disks.

Notes

Summary

3m 09s



This matter is present in very high temperature and is in the state called plasma. In a plasma, electrons are torn from the nuclei of atoms. Ions and electrons are therefore free and will interact with electromagnetic fields.

Notes

Summary

4m 07s