

A Spinning Coin Explained

Teacher Notes for Years 7-10



In the video **A Spinning Coin Explained**, we examine the motion of both a spinning coin and Euler's disc, finding that it is a combination of spinning and rolling.

Video Summary

In the previous video, *Spinning, Rolling and Hula Hooping*, we examined hula hoops and were introduced to a new word: 'spolling' - a combination of spinning and rolling. In this video we spin a coin and find spolling there, too.

Unlike a hula hoop, the coin is not spolling about a central axis. Instead, the coin has one point of contact with the surface that it is spolling on. Because of this, we can see the axis of symmetry "precess."

Precession is the motion of the rotational axis of a spinning body. For instance, how a spinning top 'wobbles' when it slows down.

As the coin decreases its angle with the surface, the rate of its precession increases.

The coin lost most of its kinetic energy through friction with the surface. In the case of the Euler's Disk there is less friction between the surface and the disk, and as such the precession effect lasts for a much longer time.

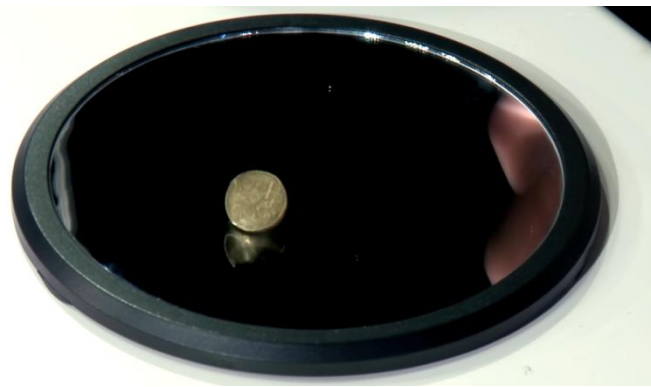


Figure 2: A spinning coin.

Science Understanding (Year 7, 8, & 10)

Physical sciences

Change to an object's motion is caused by unbalanced forces acting on the object. (Year 7)

When you set a coin spinning, you are using two forces from your fingers acting on either side but in opposite directions.

Energy appears in different forms including kinetic and potential energy, and causes change within systems. (Year 8)

Energy conservation in a system can be explained by describing energy transfers and transformations. (Year 10)

Energy is lost though friction as the coin spolls on the surface. This energy is lost through friction, and can be observed as transforming into sound energy, and some heat energy.

The motion of objects can be described and predicted using the laws of physics. (Year 10)

As complicated as the motion of spolling seems to be, it can be thought of as a combination of several physical laws. The spinning coin has circular motion, while friction against the point of contact on the surface causes the coin to lose energy.

Nature and development of science

Scientific understanding, including models and theories, are contestable and refined over time through a process of review by the scientific community. (Year 9)

Leonhard Euler was fascinated by the dynamics of a spinning coin, and studied it in detail. The understanding and modelling of this motion still continues today.

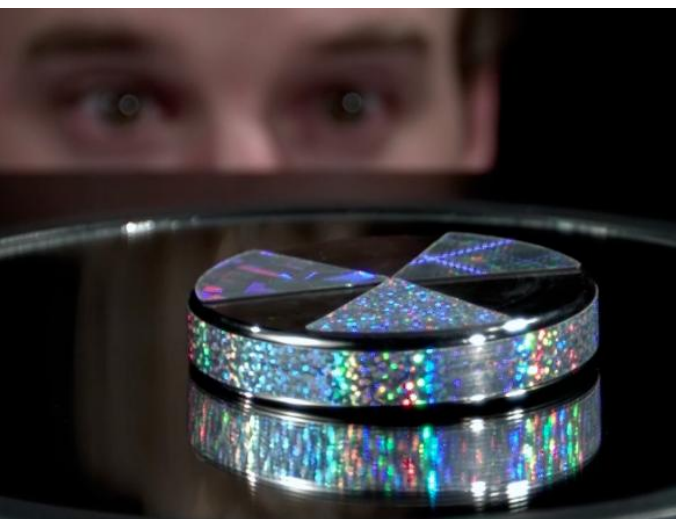


Figure 1: The Euler's Disc.

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