

The Physics Experiments of Robert Wichard Pohl (1884–1976)

For decades, Robert Wichard Pohl taught his famous lectures of introductory physics in the old lecture hall of the Physics Institute at Goettingen University. These lectures became the foundation for three volumes entitled „Introduction into Physics“. Now, using Professor Pohl’s original instruments in the same lecture hall in which he taught, this set of videos captures his extraordinary ingenuity and once more brings to life Pohl’s great experimental skills.



Physics of riding a bicycle with no hands

Video title: Physics of riding a bicycle with no hands

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Series title: The Physics Experiments of Robert Wichard Pohl (1884-1976)

Abstract: The small model of a bicycle is used to demonstrate the importance of precession for riding a bicycle with no hands. With the front wheel spinning, tilting the bicycle to the right (left) makes the front wheel turn to the right (left), in either case bringing the center of mass again above the line of contact of the wheels with the floor. No control by the rider (in this case a toy monkey) is required to prevent the bicycle from tipping over.

Source: Pohls Einführung in die Physik - Mechanik, Akustik und Wärmelehre. Lüders, Klaus; Pohl, Robert Otto (Hrsg.) 19. Aufl., 2005, Springer Berlin Heidelberg New York; p. 83

Key words: Mechanics, rotational motion, top, precession, bicycle

Goal of the experiment: The small model of a bicycle is used to demonstrate the importance of precession for riding a bicycle with no hands.

Experimental setup: The bicycle wheels are made to spin at high frequency by pressing them against a rotating disk driven by an electric motor. Then, tipping the bicycle around a vertical axis causes the front wheel to move right or left, as result of precession. This can be viewed either directly or by shadow projection.

Experiment: With the front wheel spinning, tilting the bicycle to the right (left) makes the front wheel turn to the right (left). With the bicycle on the floor, this motion ensures that the center of mass of the bicycle stays above the line of contact of the wheels with the floor, thus keeping the bicycle from tipping over. This is demonstrated when the bicycle is set on the floor, with its wheels spinning; without any control needed by the rider (in this case a toy monkey), the bicycle moves right across the lecture hall.

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