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.

Foucault pendulum

Video title: Foucault pendulum

Signature: C 14832

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

Abstract: A relatively simple demonstration and quantitative determination of the rotation of the earth using a simple pendulum several meters long, the so-called Foucault pendulum. The frequency of rotation can be measured in less than one minute. The principle of this experiment is demonstrated in Exp. C 14830 (Simple pendulum in a rotating frame of reference).

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Key words: Mechanics, Foucault pendulum, simple pendulum, accelerated frames of reference, rotating frames of reference, Coriolis force, rotation of the earth

Goal of the experiment: A relatively simple demonstration and quantitative determination of the rotation of the earth using a simple pendulum several meters long, the so-called Foucault pendulum. The frequency of rotation can be measured in less than one minute. The principle of this experiment is demonstrated in Exp. C 14830 (Simple pendulum in a rotating frame of reference).

Experimental setup: A 10 meter long simple pendulum with a lead sphere as bob is suspended from the ridge of the roof above a hole in the ceiling of the lecture hall. Its period of oscillation is 6.3 sec, its (very weakly damped) amplitude is 0.40 m. At one of its maximum excursions, a greatly enlarged image of the pendulum wire is projected with a lens onto the wall of the lecture hall next to the blackboard. The necessary image distance (45 m) is achieved by reflection off the rear wall of the lecture hall. For the quantitative evaluation, a glass scale with marks spaced 1 mm apart is projected together with the pendulum wire. With this setup, a shift of the wire at its maximum excursion by less than 1 mm can be demonstrated clearly to the entire audience.

Experiment: After carefully damping any spurious vibrations of the pendulum held at its maximum excursion, it is released using a mechanism that avoids shaking it. On the projection screen one can see how the maximum excursion of the pendulum wire shifts from one period to the next. After the first period (6.3 sec), the shift is clearly discernible, and after seven periods the maximum has shifted by 1 mm. A quantitative evaluation leads to the well known rotational frequency of the earth(1/day).

Note that for this evaluation the geographic latitude has to be considered at which the experiment is being performed (Goettingen: 51.5 degrees). The actual rotational frequency of rotation of the observed rosette trace (see exp. C 14830<<) is here smaller than on the pole. On the equator, it would vanish.

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