

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.



Action = reaction

Video title: Action = reaction

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

Abstract: To demonstrate that forces between two bodies always occur in pairs: They are opposite in direction and equal in magnitude. These facts were summarized by Newton with the statement „action = reaction“.

Source: Pohl's Einführung in die Physik - Mechanik, Akustik und Wärmelehre. Lüders, Klaus; Pohl, Robert Otto (Hrsg.) 19. Aufl., 2005, Springer Berlin Heidelberg New York; p. 23

Key words: Mechanics, force, force pairs, mass, conservation of linear momentum

Goal of the experiment: To demonstrate that forces between two bodies always occur in pairs: They are opposite in direction and equal in magnitude. These facts were summarized by Newton with the statement „action = reaction“.

Experimental setup: Two people are standing on flat carts on a level floor, a few meters apart. The cart wheels have very little friction, the loaded carts have the same masses (achieved through the addition of a 25 kg iron weight on one of the carts). The forces are exerted by means of a rope.

Experiment: 1. Both people pull on the rope. The carts move towards each other, meeting half way. This point is marked with another weight.

2. One of the people ties the rope to his belt, puts his hands in his pockets, leaving it to the other person to do all the work. The result, however, is the same: both carts again meet halfway.

The experiment shows that in both cases the forces are equal in magnitude and opposite in direction, in short: action = reaction. It also shows that the total momentum of the system is conserved. The initial momentum is zero. Since the carts meet in the middle, they must have the same speed (opposite velocities), hence equal and opposite momentum. Consequently, the total momentum stays zero, i.e. it is conserved.

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