

# 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.



## Dynamic stability of a bicycle chain

**Video title:** Dynamic stability of a bicycle chain

**Signature:** C 14825

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

**Abstract:** Belts made of soft material which are flexible while at rest, in this case a chain made of metal links, can become quite rigid, independent of their shape, when their tangential velocity is sufficiently large. This phenomenon is called „dynamic stability“.

**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. 33

**Key words:** Mechanics, dynamic stability, radial force, radial acceleration

**Goal of the experiment:** Belts made of soft material which are flexible while at rest, in this case a chain made of metal links, can become quite rigid, independent of their shape, when their tangential velocity is sufficiently large. This phenomenon is called „dynamic stability“.

**Experimental setup:** A bicycle chain is suspended on a toothed wheel attached to the horizontal shaft of an electric motor. In order to test the rigidity of the chain at high speeds, a wooden board is used for lifting it off the wheel.

**Experiment:** The motor is driven at a frequency of 30/sec, moving the chain with a tangential velocity of approximately 20 m/sec. Through the radial forces the chain stiffens, and after it gets thrown off the toothed wheel, it rolls along the floor, jumps over a wooden beam, and collapses into its shapeless form only after coming to rest on the rug after colliding with the wall. The same experiment is viewed by running the film in slow motion. It is clearly seen how the stiff chain deforms somewhat as it hits the beam. Note also how long the chain continues to rotate on the rug near the end of the experiment, before it finally comes to rest and collapses.

The motor is driven at a frequency of 30/sec, moving the chain with a tangential velocity of approximately 20 m/sec. Through the radial forces the chain stiffens, and after it gets thrown off the toothed wheel, it rolls along the floor, jumps over a wooden beam, and collapses into its shapeless form only after coming to rest on the rug after colliding with the wall. The same experiment is viewed by running the film in slow motion. It is clearly seen how the stiff chain deforms somewhat as it hits the beam. Note also how long the chain continues to rotate on the rug near the end of the experiment, before it finally comes to rest and collapses.

**Scientific Contributors:** Klaus Lüders  
Robert Otto Pohl  
Gustav Beuermann  
Konrad Samwer  
Department of Physics, Free University Berlin, Germany  
Laboratory of Atomic and Solid State Physics, Cornell University, Ithaca, USA  
I. Physical Institute, University Goettingen, Germany  
I. Physical Institute, University Goettingen, Germany

**Editor:** Walter Stickan  
**Camera:** Kuno Lechner  
**Assistant:** Verena Gruber  
**Sound:** Frank Polomsky  
**Video Editing:** Abbas Yousefpour  
**Technical Assistant:** Joachim Feist

**Production and Distribution:** IWF Wissen und Medien gGmbH, <http://www.iwf.de>, © IWF Goettingen 2006

IWF Wissen und Medien gGmbH  
Nonnenstieg 72, D-37075 Goettingen  
Phone: +49 (0) 551 5024 0  
[www.iwf.de](http://www.iwf.de)

 Leibniz  
Gemeinschaft

 IWF  
WISSEN UND MEDIEN  
KNOWLEDGE AND MEDIA