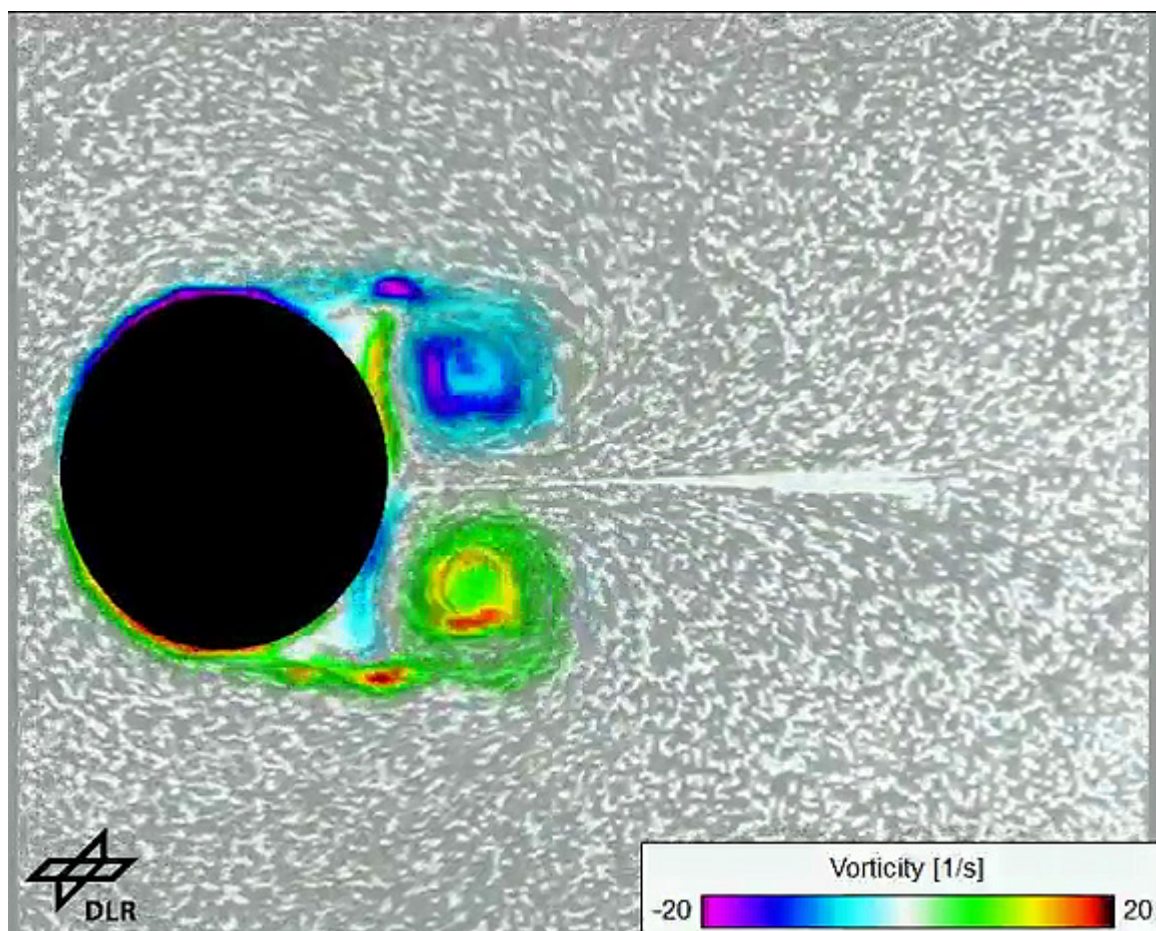


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Eighty-year old film from the pioneering era of fluid mechanics evaluated using modern measurement techniques

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What happens when a cylinder is placed in flowing water? What vortices form behind a knife-edge or on an aerofoil? Footage captured by the Göttingen aeronautics pioneer Ludwig Prandtl 80 years ago, when fluid mechanics research was still in its infancy, provides the answers to these questions. The quality of these early films was so good that DLR researchers were able to evaluate them using modern measurement techniques, leading to worldwide acclaim and the award of an international prize.



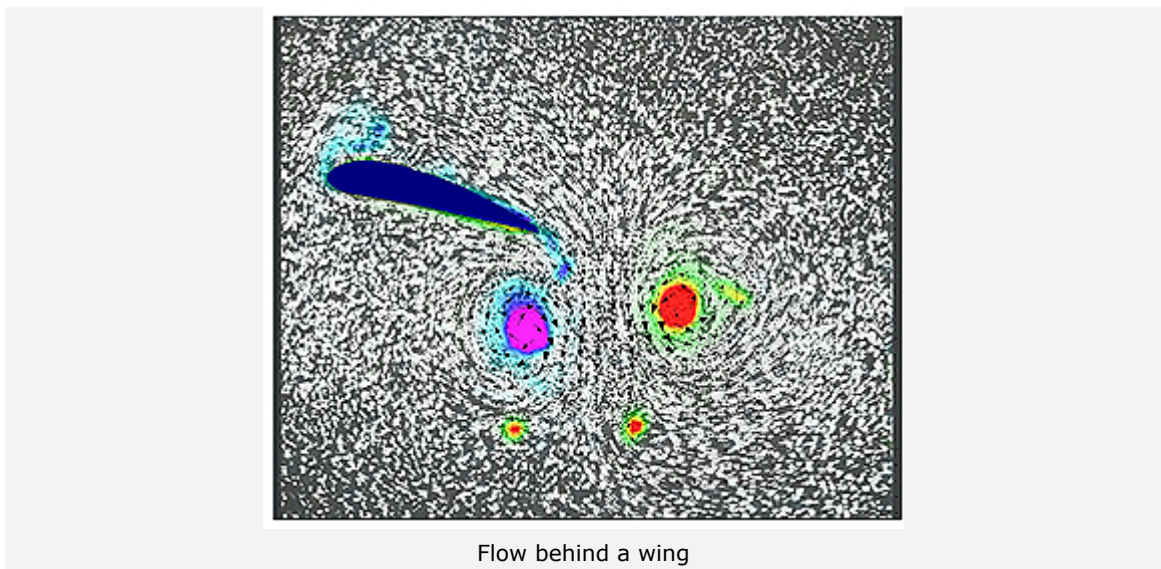
Ludwig Prandtl with the water test tunnel in Hanover

Ludwig Prandtl, who is considered to be the father of modern aerodynamics, made the films for demonstrative and illustrative purposes in the 1920s and 1930s, while he was at the Kaiser Wilhelm Institute for Fluid Mechanics in Göttingen, or, as it is now known, the Max Planck Institute for Dynamics and Self-Organization. In order to visualise fluid flow, Prandtl introduced small aluminium particles onto the water surface in the test channels, which were still manually driven in some cases.

Progress in flow visualisation

DLR researchers Christian Willert (Cologne) and Jürgen Kompenhans (Göttingen) tracked the movement of these particles using modern computer-based Particle Image Velocimetry (PIV) techniques. "We were able to determine the strengths and speeds of the vortices and visualise them using false colours," explains Kompenhans. Prandtl had not been able to do this. This treatment of the historical material clearly demonstrates the progress made in flow visualisation, from the early, simple presentation to a quantitative measurement method.

Willert and Kompenhans received the Best Movie Award at the 14th International Symposium on Flow Visualization in Daegu, South Korea, for their contribution, *PIV Analysis of Ludwig Prandtl's Historic Flow Visualization Films*.



Flow behind a wing

Prandtl developed several different flow channels and wind tunnels with which he could visualise flows. Together with his co-workers, Tietjens and Müller, he placed a camera above a flow channel to capture the movement of the fluid. He was among the first scientists ever to use the medium of film to document research results, thereby making these results available to others working in this discipline.

IWF Wissen und Medien gGmbH has released a special edition DVD 'Ludwig Prandtl – Generation of Vortices in Water Flows', which contains films recorded between 1927 and 1933 and subsequently made public as educational material in 1936.

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