

MECHANICS COLLOQUIUM

Wednesday, 17th December 2003

14:45-15:45 h.

Faculty of Design, Engineering and Production, Room U

"Stability of an Uncontrolled Bicycle"

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Abstract - "... motorcycle design at present relies on experience rather than understanding for its success." With these words Robin Sharp started his 1971 benchmark paper on the stability and control of motorcycles. Today this is still true for bicycles. In contrast to motorcycles, where the tires play an important role in the dynamic response of the system, here the wheel-road contact can be approximated by an ideal pure-rolling constraint. In this presentation I will focus on the stability of an upright uncontrolled bicycle with rigid rider and no control, the so-called hands-free case. Results from the linearized stability analysis are compared with the results from a full nonlinear dynamic analysis. Some attention will be given to the applied modelling technique, being a Finite Element approach. Finally, the world of bicycle stability is full of myth and folklore. I will present some facts to disprove these.

About the speaker - <http://www.ocp.tudelft.nl/em/staf/schwab/>

Arend Schwab is an Assistant Professor of Applied Mechanics at Delft University at the Department of Mechanical Engineering. Professor Schwab received his M.Sc. degree in 1984 and his Ph.D. degree in Mechanical Engineering from Delft University of Technology in 2002. His research interests are in the Dynamics of Mechanical Systems, the so-called Multibody Dynamics. In particular the treatment of contact phenomena like in collisions and rolling (non-holonomic constraints) has his special interest. He is also active in the field of biomechanics, particularly legged locomotion. The work on bicycle dynamics has been done during his recent sabbatical year at Cornell University with Andy Ruina.