

Public Lecture:
Interesting Phenomena in Nonlinear Problems, Demonstrated for
some Examples, e.g., Dew Drops on Spider Webs

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This lecture is an appetizer for my two books in OUP:

Numerical Methods for Nonlinear Elliptic Differential Equations, A Synopsis,
Numerical Methods for Bifurcation and Center Manifolds in Nonlinear Elliptic
and Parabolic Differential Equations, 2010 and 2011.

I discuss the difference of linear and nonlinear problems. The latter are observed whenever different components of a system interact with each other. I present some introductory examples. They show some of the fascinating scenarios of nonlinear problems. Unexpected new solutions are observed and the original symmetry of the system gets lost, so called *symmetry breaking bifurcation*. The main example will be lines of dew drops on spider webs. They are frequently observed on cold mornings. Although dew is supposed to condense somehow evenly along the thread, only lines of drops are observed along the spider thread. What are the reasons for this difference? We present the basic ideas of a model explaining the generation of dew drops by concentrating on some essential aspects only. I will only indicate: Despite many simplifications the model still provides very interesting mathematical challenges. In fact the necessary mathematical model and the corresponding numerical methods for this problem are so complicated that in its full complexity it never had been studied before Karlheinz Schild, Bernhard Schmitt and I did so in Marburg.