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Dew drops on spider webs: a symmetry breaking bifurcation for a parabolic differential-algebraic equation

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Lines of dew drops on spider webs are frequently observed on cold mornings. I have chosen it for a presentation requested by the Hessian TV as an example known to everybody, demonstrating aspects of modern mathematical problems. In this lecture I present a model explaining their generation. 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? I give an explanation by concentrating on some essential aspects only. This every-day observation is an example for one of the fascinating scenarios of nonlinear problems, *symmetry breaking bifurcation.* 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 it never has been studied before. We analyse and numerically study symmetry breaking bifurcations for a free boundary value problem of a degenerate parabolic differential-algebraic equation employing a combination of analytical and numerical tools. In Marburg Karlheinz Schild, Bernhard Schmitt and I have solved this problem.