Title: The shortest path: complex detours in real computation

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To paraphrase the well-known saying variously attributed to Hadamard

and Painleve', the shortest path between two truths in numerical

mathematics goes through the complex plane. In this talk we give an

overview of a few such examples, beginning with the well-known

Runge phenomenon: those wild oscillations that appear when

polynomial interpolation of high degree approximates certain

functions. From here it is a small step to the kink phenomenon,

first brought to popular attention in a 2008 SIAM Review paper

by Nick Trefethen when he asked whether Gauss quadrature

is indeed better than Clenshaw-Curtis by the factor of two

that the theory predicts. Other examples come from

differential equations, one of which is shock formation

in the inviscid Burgers equation. The shock can be interpreted

as a singularity that forms in the complex plane and reaches the

real axis in finite time. For a well-chosen initial condition,

an explicit solution in terms of Lambert's W-function completely

characterizes the singularity structure and the dynamics.