

2015 Cornelius Pings Lecture

“Fluid-filled Fracture Propagation Using Phase Field”

Professor Mary F. Wheeler

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The University of Texas at Austin
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Time: 11:15 A.M.

Doheny Library Room DML 240

A reception will follow in DML 240 Breezeway

In this presentation, we discuss current research on fluid-filled fracture propagation using a phase-field diffusive zone algorithm and coupling to a reservoir simulator. Phase field modeling has been used for the past decade in modeling fractures in an elastic medium. Recently in collaboration with Andro Mikelic and Thomas Wick we extended this method to pressurized fractures in a poroelastic medium. This thermodynamically consistent approach captures several characteristic features of crack propagation such as joining, branching and non-planar propagation in heterogeneous porous media as well as fracture width evolution and fracture-length propagation. Here we also describe a technique for coupling phase-field to a fractured poroelastic reservoir simulator. We present two and three-dimensional numerical tests to benchmark, compare and demonstrate the predictive capabilities of the fracture propagation model as well as the proposed coupling scheme.



Mary Fanett Wheeler was born in Cuero, Texas, near San Antonio. She had always been interested in mathematics and took a course in it 'just for fun'. She ended up with enough courses to graduate in mathematics as well." Mary Wheeler earned a double major in social sciences and mathematics in 1960 at the University of Texas. She received an M.A. from the University of Texas in 1963, and her Ph.D. (1971) from Rice University (when her daughter was 3 years old.) Her Ph.D. thesis was on "A Priori L2 Error Estimates for Galerkin Approximations to Parabolic Partial Differential Equations". She began teaching at Rice University in 1971, rising through the ranks until in 1988 she was appointed as Noah Harding Professor of Computational and Applied Mathematics (first woman to hold such a position at Rice.)

Since 1995 she has held the Ernest and Virginia Cockrell Chair in Engineering in the Department of Mathematics at the University of Texas in Austin. She works on numerical solutions of partial differential equations, parallel computation, and modeling flow in porous media. She has written over 200 research papers and technical reports, and authored 7 books.

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