ME Seminar

Saffman-Taylor fingers — Theory and Numerics

Dr. Satyajit Pramanik, Assistant Professor, Department of Mathematics, Indian Institute of Technology Guwahati

ABSTRACT

In this talk, we will discuss Saffman-Taylor (ST) fingering, also known as viscous fingering (VF). VF occurs when a less viscous fluid penetrates a more viscous fluid in confinement (Hele-Shaw cell or porous media). We utilise linear stability analysis, nonlinear simulations and asymptotic analysis to discuss the onset of instability, nonlinear finger propagation, and long-time fate of the fingers in reactive as well as non-reactive displacements. We will conclude the talk with a discussion on some future research directions with potential applications in enhanced oil recovery (EOR), carbon-capture and sequestration (CCU), and chromatography separation.

ABOUT THE SPEAKER

Satyajit is an Assistant Professor in the Department of Mathematics at IIT Guwahati. He is interested in using mathematics in understanding fluid mechanical and physical processes around us. His research has explored porous media, hydrodynamic instabilities, homogenization techniques using the method of multiple scales, numerical simulations and modal as well as non-modal analyses. He graduated from IIT Kharagpur in 2011 with a first class in M.Sc. Mathematics degree and was awarded the Institute Silver Medal for being adjudged the best graduating student in M.Sc. Mathematics. He earned his PhD in Mathematics at IIT Ropar in 2016 and was awarded the Best Thesis Award in Mathematics (2018). He worked as a postdoctoral research assistant (2019-2020) at Oxford, a postdoc (2016–2019) at the Nordic Institute for Theoretical Physics (NORDITA), Sweden. He has also worked as a visiting researcher at TU Wien (2014–2015) and ULB Belgium (2014). He has published several research papers in international peer-reviewed journals.

27th February 2026, 04.00 PM, AR Auditorium, Department of Mechanical Engineering, IISc