



# **Multiphase Flow in Porous Media: Mechanics, Mathematics, and Numerics (Lecture Notes in Engineering)**

*Myron B. III Allen, Grace A. Behie, John A. Trangenstein*

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The past decade has seen remarkable growth in research related to petroleum reservoir simulation. This growth reflects several developments, not the least of which is the increased interest in oil recovery technologies requiring sophisticated engineering. Augmenting this interest has been the broader availability of supercomputers capable of handling the tremendous computational demands of a typical reservoir simulator. The field of reservoir simulation incorporates several major facets of applied mathematics. First, in view of the variety and complexity of the processes encountered, it is imperative that the modeler adopt a systematic approach to establishing the equations governing reservoir flows. Second, the mathematical structure of these flow equations needs to be carefully analyzed in order to develop appropriate and efficient numerical methods for their solution. Third, since some aspects of the discretized flow equations are typically stiff, one must develop efficient schemes for solving large sparse systems of linear equations. This monograph has three parts, each devoted to one of these three aspects of reservoir modeling. The text grew out of a set of lectures presented by the authors in the autumn of 1986 at the IBM Scientific Center in Bergen, Norway. We feel that it is only appropriate to caution the reader that many of the ideas that we present in this monograph do not reflect standard approaches in petroleum reservoir simulation. In fact, our aim is to outline promising new ways of attacking reservoir simulation problems, rather than to compile another textbook for the mainstream.

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