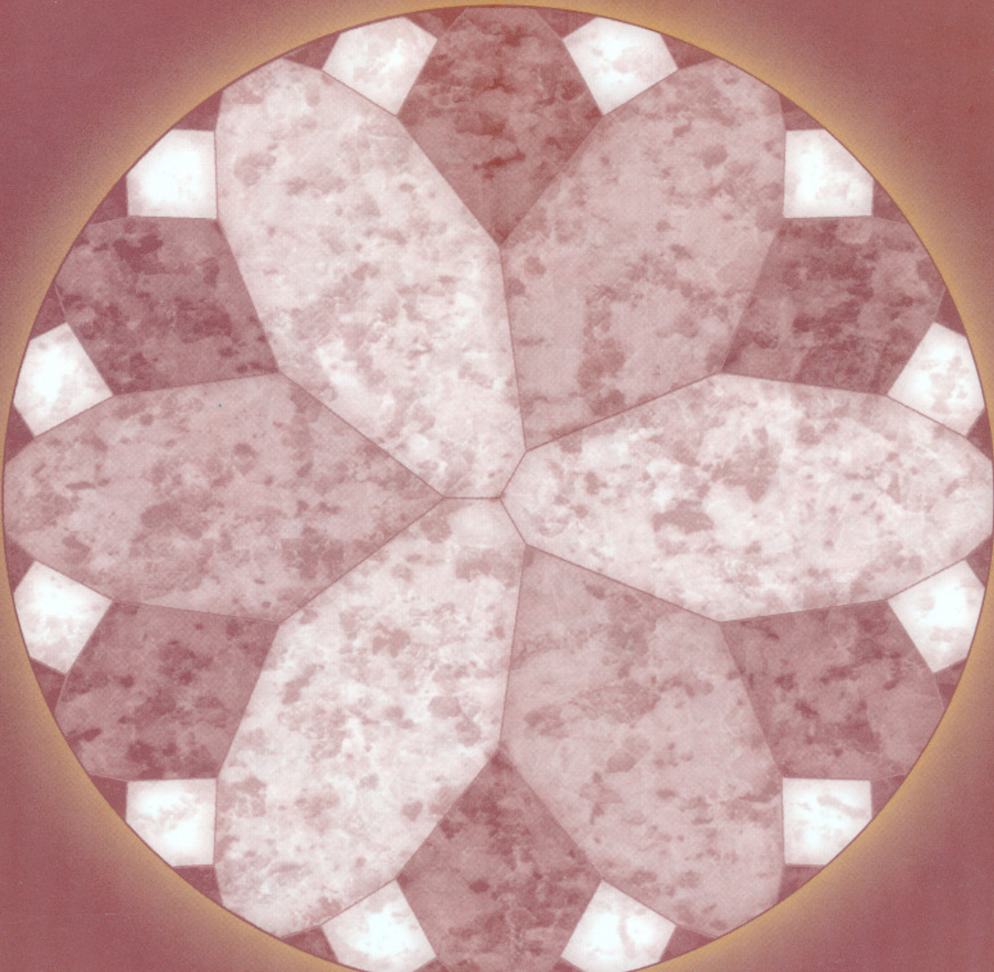
Porous and Complex Flow Structures in Modern Technologies



Adrian Bejan • Ibrahim Dincer • Sylvie Lorente
Antonio F. Miguel • A. Heitor Reis

Adrian Bejan
Duke University
Dept. of Mechanical Engineering
and Materials Science
Durham, NC 27708-0300
USA
dalford@duke.edu

Ibrahim Dincer
University of Ontario Institute
of Technology
School of Manufacturing Engineering
Oshawa, Ontario L1H 7K4
CANADA
Ibrahim.Dincer@uoit.ca

Sylvie Lorente
Laboratoire Matériaux et
Durabilité des Constructions
Institut National des Sciences Appliquées
Département de Génie Civil
31077 Toulouse
FRANCE
lorente@insa-tlse.fr

Antonio Miguel
Universidade de Évora
Departamento de Fisica
Colegio Luis Verney
7000-671 Évora
PORTUGAL
afm@uevora.pt

Heitor Reis
Universidade de Évora
Departamento de Fisica
Colegio Luis Verney
7000-671 Évora
PORTUGAL
ahr@uevora.pt

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Porous and Complex Flow Structures in Modern Technologies represents a new approach to the field, considering the fundamentals of porous media in terms of the key roles played by these materials in modern technology. Intended as a text for advanced undergraduates and as a reference for practicing engineers, the book uses the physics of flows in porous materials to tie together a wide variety of important issues from such fields as biomedical engineering, energy conversion, civil engineering, electronics, chemical engineering, and environmental engineering.

For example, flows through porous ground play a central role in energy exploration and recovery (oil, geothermal fluids), energy conversion (effluents from refineries and power plants), and environmental engineering (leachates from waste repositories). Similarly, the demands of miniaturization in electronics and in biomedical applications are driving research into the flow of heat and fluids through small-scale porous media (heat exchangers, filters, gas exchangers). Filters, catalytic converters, the drying of stored grains, and myriad other applications involve flows through porous media.

Another new feature is the 'constructal' approach to the generation of flow structures for maximal global performance (e.g. maximal heat transfer density) at decreasing length scales. In this direction, the optimized structures become 'designed porous media'.

By providing a unified theoretical framework that includes not only the traditional homogeneous and isotropic media but also coarse structures in which the assumptions of representative elemental volumes or global thermal equilibrium fail, the book provides practicing engineers the tools they need to analyze complex situations that arise in practice. This volume includes examples, a large number of current references, and an extensive glossary of symbols.

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