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Micro- and Nanoscale Fluid Mechanics Micro- and Nanoscale Fluid Mechanics **An Introduction to Fluid Mechanics and Transport Phenomena** Mechanics of Sediment Transport **Advanced Transport Phenomena** *Flow and Transport in the Natural Environment: Advances and Applications* Stochastic Transport in Complex Systems Training Manual on Transport and Fluids *Problems for Biomedical Fluid Mechanics and Transport Phenomena* **Microscopic Chaos, Fractals and Transport in Nonequilibrium Statistical Mechanics Mechanics of Sediment Transport** *Conceptual Models of Flow and Transport in the Fractured Vadose Zone* **Mechanics of Coastal Sediment Transport** Fault Mechanics and Transport Properties of Rocks **Analytical Solutions for Transport Processes** *Mechanics of Sediment Transportation and Alluvial Stream Problems* **Transport Phenomena in Multiphase Flows Advanced Physics of Electron Transport in Semiconductors and Nanostructures Fundamentals of Transport Phenomena in Porous Media Fluid Mechanics and Mass Transport in Arteriolar-sized Suspension Flows with Applications for Blood Substitutes** Fluid Transport in Porous Media Mechanics and Energetics of Biological Transport **Interfacial Transport Phenomena** An Introduction to Soil Mechanics **Transport in Fluidized Particle Systems Engineering Fluid Mechanics Mechanics of Bedload Transport in the Saltation and Sheetflow Regimes An Introduction to the Boltzmann Equation and Transport Processes in Gases Problems for Biomedical Fluid Mechanics and Transport Phenomena Biofluid Mechanics** Environmental Fluid Mechanics Interfacial Transport Phenomena **The Ramifications of Diffusive Volume Transport in Classical Fluid Mechanics Fault Mechanics and Transport Properties of Rocks Laminar Flow and Convective Transport Processes Mechanics of Sediment Transport Applied Statistical Mechanics** *Mechanics of Mass Sediment Transport in Scripps Submarine Canyon, California* **Transport Phenomena** *Vectors, Tensors and the Basic Equations of Fluid Mechanics*

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Both broad and deep in coverage, Rubenstein shows that fluid mechanics principles can be applied not only to blood circulation, but also to air flow through the lungs, joint lubrication, intraocular fluid movement and renal transport. Each section initiates discussion with governing equations, derives the state equations and then shows examples of their usage. Clinical applications, extensive worked examples, and numerous end of chapter problems clearly show the applications of fluid mechanics to biomedical engineering situations. A section on experimental techniques provides a springboard for future research efforts in the subject area. Uses language and math that is appropriate and conducive for undergraduate learning, containing many worked examples and end of chapter problems All engineering concepts and equations are developed within a biological context Covers topics in the traditional biofluids curriculum, as well as addressing other systems in the body that can be described by biofluid mechanics principles, such as air flow through the lungs, joint lubrication, intraocular fluid movement, and renal transport Clinical applications are discussed throughout the book, providing practical applications for the concepts discussed. This book presents the studies on sediment transport in suspension and sediment transport in steep channels. It discusses the degradation and particle sorting processes. This unique resource offers over two hundred well-tested bioengineering problems for teaching and examinations. Solutions are available to instructors online. This book covers classical kinetic theory of gases, presenting basic principles in a self-contained framework and from a more rigorous approach based on the Boltzmann equation. Uses methods in kinetic theory for determining the transport coefficients of gases. Fluid flow and solute transport within the vadose zone, the unsaturated zone between the land surface and the water table, can be the cause of expanded plumes arising from localized contaminant sources. An understanding of vadose zone processes is, therefore, an essential prerequisite for cost-effective contaminant remediation efforts. In addition, because such features are potential avenues for rapid transport of chemicals from contamination sources to the water table, the presence of fractures and other channel-like openings in the vadose zone poses a particularly significant problem, Conceptual Models of Flow and Transport in the Fractured Vadose Zone is based on the work of a panel established under the auspices of the U.S. National Committee for Rock Mechanics. It emphasizes the importance of conceptual models and goes on to review the conceptual model development, testing, and refinement processes. The book examines fluid flow and transport mechanisms, noting the difficulty of modeling solute transport, and identifies geochemical and environmental tracer data as important components of the modeling process. Finally, the book recommends several areas for continued research. This book provides analytical solutions to a number of classical problems in transport processes, i.e. in fluid mechanics, heat and mass transfer. Expanding computing power and more efficient numerical methods have increased the importance of computational tools. However, the interpretation of these results is often difficult and the computational results need to be tested against the analytical results, making analytical solutions a valuable commodity. Furthermore, analytical solutions for transport processes provide a much deeper understanding of the physical phenomena involved in a given process than do corresponding numerical solutions. Though this book primarily addresses the needs of researchers and practitioners, it may also be beneficial for graduate students just entering the field. This book is devoted to advances made in some key areas of mathematical modelling involving the application of fluid mechanics to fluid transport and electric conduction in porous media. Transport phenomena is used here to descril>e momentum, energy, mass, and entropy transfer (Bird et al. 1960, 1980). It includes thermodynamies, a special case of which is thermostatics. Interfacial transport phenomena refers to momentum, energy , mass, and entropy transfer within the immediate neighborhood of a phase interface, including the thermodynamies of the interface. In terms of qualitative physical observations, this is a very old field. Pliny the EIder (Gaius Plinius Secundus, 23-79 A.D.; Pliny 1938) described divers who released small quantities of oil from their mouths, in order to damp capillary ripples on the ocean surface and in this way provide more uniform lighting for their work. Similar stories were retold by Benjamin Franklin, who conducted experiments of his own in England (V an Doren 1938). In terms of analysis, this is a generally young field. Surface thermostatics developed relatively early, starting with Gibbs (1948) and continuing with important contributions by many others (see Chapter 5). This festschrift, compiled from the symposium held in honor of W.F. Brace, is a timely overview of fault mechanics and transport properties of rock. State-of-the-art research is presented by internationally recognized experts, who highlight developments in this contemporary area of study subsequent to Bill Brace's pioneering work. Key Features * The strength of brittle rocks * The effects of stress and stress-induced damage on physical properties of rock * Permeability and fluid flow in rocks * The strength of rocks and tectonic processes This is an extensively revised second edition of "Interfacial Transport Phenomena", a unique presentation of transport phenomena or continuum mechanics focused on momentum, energy, and mass transfer at interfaces. It discusses transport phenomena at common lines or three-phase lines of contact. The emphasis is upon achieving an in-depth understanding based upon first principles. It includes exercises and answers, and can serve as a graduate level textbook. I have learned a lot from John Neu over the past years, and his book reflects very well his sense of style and purpose. --Walter Craig, McMaster University, Hamilton, Ontario, Canada and Fields Institute for Research in Mathematical Sciences, Toronto, Ontario, Canada John Neu's book presents the basic ideas of fluid mechanics, and of the transport of matter, in a clear and reader-friendly way. Then it proposes a collection of problems, starting with easy ones and gradually leading up to harder ones. Each problem is solved with all the steps explained. In the course of solving these problems, many fundamental methods of analysis are introduced and explained. This is an ideal book for use as a text, or for individual study. --Joseph B. Keller, Stanford University This book presents elementary models of transport in continuous media and a corresponding body of mathematical technique. Physical topics include convection and diffusion as the simplest models of transport; local conservation laws with sources as the general framework of continuum mechanics; ideal fluid as the simplest model of a medium with mass; momentum and energy transport; and finally, free surface waves, in particular, shallow water theory. There is a strong emphasis on dimensional analysis and scaling. Some topics, such as physical similarity and similarity solutions, are traditional. In addition, there are reductions based on scaling, such as incompressible flow as a limit of compressible flow, and shallow water theory derived asymptotically from the full equations of free surface waves. More and deeper examples are presented as problems, including a series of problems that model a tsunami approaching the shore. The problems form an embedded subtext to the book. Each problem is followed by a detailed solution emphasizing process and craftsmanship. The problems express the practice of applied mathematics as the examination and re-examination of simple but essential ideas in many interrelated examples. Introductory text, geared toward advanced undergraduate and graduate students, applies mathematics of Cartesian and general tensors to physical field theories and demonstrates them in terms of the theory of fluid mechanics. 1962 edition. Chien (hydraulic engineering, Tsinghua University) and Wan (China Institute of Water Resources and Hydro-power) cover every essential phase of the mechanics of sediment transport by examining the processes of erosion, transportation and deposition of sediment particles under gravity, flowing water, A valuable introduction for newcomers as well as an important reference and source of inspiration for established researchers, this book provides an up-to-date summary of central topics in the field of nonequilibrium statistical mechanics and dynamical systems theory. Understanding macroscopic properties of matter starting from microscopic chaos in the equations of motion of single atoms or molecules is a key problem in nonequilibrium statistical mechanics. Of particular interest both for theory and applications are transport processes such as diffusion, reaction, conduction and viscosity. Recent advances towards a deterministic theory of nonequilibrium statistical physics are summarized: Both Hamiltonian dynamical systems under nonequilibrium boundary conditions and non-Hamiltonian modelings of nonequilibrium steady states by using thermal reservoirs are considered. The surprising new results include transport coefficients that are fractal functions of control parameters, fundamental relations between transport coefficients and chaos quantities, and an understanding of nonequilibrium entropy production in terms of fractal measures and attractors. The theory is particularly useful for the description of many-particle systems with properties in-between conventional thermodynamics and nonlinear science, as they are frequently encountered on nanoscales. This book treats the subject of sediment transport in the marine environment, covering transport of noncohesive sediment by waves and currents in- and outside the surf zone. It can be read independently, but a background in hydraulics and basic wave mechanics is required. The primary aim of the book is to describe the physical processes of sediment transport and how to represent them in mathematical models. The book can be divided in two main parts; in the first, the relevant hydrodynamic theory is described. This part contains a review of elementary theory for water waves, chapters on the turbulent wave boundary layer and the turbulent interaction between waves and currents, and finally, surf zone hydrodynamics and wave driven currents. The second part covers sediment transport and morphological development.The part on sediment transport introduces the basic concepts (critical bed shear stress, bed load, suspended load and sheet layer, near-bed concentration, effect of sloping bed); it treats suspended sediment in waves and current and in the surf zone, and current and wave-generated bed forms. Finally, the modelling of cross-shore and long-shore sediment transport is described together with the development of coastal profiles and coastlines. (Cont.) The remainder of the thesis, which constitutes the bulk of the work performed, focuses on testing the proposed equation set against known experimental data. Each of the physically measurable phenomena treated herein was previously believed outside the realm of classical continuum fluid dynamics. We begin by considering the thermophoretic and diffusiophoretic motion of particles suspended in gases or liquids. We continue by studying the thermo-molecular pressure drop which results from applying a temperature gradient across the ends of a closed capillary. We conclude by presenting a hydrodynamic/Brownian motion model of thermal diffusion in liquids, wherein theoretical predictions for the Soret coefficient in a binary liquid system are presented that may be evaluated from readily available physicochemical data. It is shown, in each case, that the predictions of our modified theory are in agreement with experimental data. The final chapter of this dissertation is dedicated to utilizing the results derived in the previous chapters to comment on the veracity of the claim that the specific linear momentum in a fluid is given by the volume, rather than the barycentric, velocity. General arguments supporting this claim are presented and then followed by a list of questions which remain to be answered. Finally, a list of proposed experiments are detailed which could further test the predictions made herein. Advanced Transport Phenomena is ideal as a graduate textbook. It contains a detailed discussion of modern analytic methods for the solution of fluid mechanics and heat and mass transfer problems, focusing on approximations based on scaling and asymptotic methods, beginning with the derivation of basic equations and boundary conditions and concluding with linear stability theory. Also covered are unidirectional flows, lubrication and thin-film theory, creeping flows, boundary layer theory, and convective heat and mass transport at high and low Reynolds numbers. The emphasis is on basic physics, scaling and nondimensionalization, and approximations that can be used to obtain solutions that are due either to geometric simplifications, or large or small values of dimensionless parameters. The author emphasizes setting up problems and extracting as much information as possible short of obtaining detailed solutions of differential equations. The book also focuses on the solutions of representative problems. This reflects the book's goal of teaching readers to think about the solution of transport problems. This textbook is aimed at second-year graduate students in Physics, Electrical Engineering, or Materials Science. It presents a rigorous introduction to electronic transport in solids, especially at the nanometer scale.Understanding electronic transport in solids requires some basic knowledge of Hamiltonian Classical Mechanics, Quantum Mechanics, Condensed Matter Theory, and Statistical Mechanics. Hence, this book discusses those sub-topics which are required to deal with electronic transport in a single, self-contained course. This will be useful for students who intend to work in academia or the nano/ micro-electronics industry.Further topics covered include: the theory of energy bands in crystals, of second quantization and elementary excitations in solids, of the dielectric properties of semiconductors with an emphasis on dielectric screening and coupled interfacial modes, of electron scattering with phonons, plasmons, electrons and photons, of the derivation of transport equations in semiconductors and semiconductor nanostructures somewhat at the quantum level, but mainly at the semi-classical level. The text presents examples relevant to current research, thus not only about Si, but also about III-V compound semiconductors, nanowires, graphene and graphene nanoribbons. In particular, the text gives major emphasis to plane-wave methods applied to the electronic structure of solids, both DFT and empirical pseudopotentials, always paying attention to their effects on electronic transport and its numerical treatment. The core of the text is electronic transport, with ample discussions of the transport equations derived both in the quantum picture (the Liouville-von Neumann equation) and semi-classically (the Boltzmann transport equation, BTE). An advanced chapter, Chapter 18, is strictly related to the ‘tricky’ transition from the time-reversible Liouville-von Neumann equation to the time-irreversible Green’s functions, to the density-matrix formalism and, classically, to the Boltzmann transport equation. Finally, several methods for solving the BTE are also reviewed, including the method of moments, iterative methods, direct matrix inversion, Cellular Automata and Monte Carlo. Four appendices complete the text. The first part of the book provides a pedagogical introduction to the physics of complex systems driven far from equilibrium. In this part we discuss the basic concepts and theoretical techniques which are commonly used to study classical stochastic transport in systems of interacting driven particles. The analytical techniques include mean-field theories, matrix product ansatz, renormalization group, etc. and the numerical methods are mostly based on computer simulations. In the second part of the book these concepts and techniques are applied not only to vehicular traffic but also to transport and traffic-like phenomena in living systems ranging from collective movements of social insects (for example, ants) on trails to intracellular molecular motor transport. These demonstrate the conceptual unity of the fundamental principles underlying the apparent diversity of the systems and the utility of the theoretical toolbox of non-equilibrium statistical mechanics in interdisciplinary research far beyond the traditional disciplinary boundaries of physics. Leading industry experts provide a broad overview of the interdisciplinary nature of physics Presents unified descriptions of intracellular, ant, and vehicular traffic from a physics point of view Applies theoretical methods in practical everyday situations Reference and guide for physicists, engineers and graduate students This book systematically introduces engineering fluid mechanics in a simple and understandable way, focusing on the basic concepts, principles and methods. Engineering fluid mechanics is necessary for professionals and students in fields such as civil, environmental, mechanical, and petroleum engineering. Unlike most of the current textbooks and monographs, which are too complicated and include huge numbers of math formulas and equations, this book introduces essential concepts and flow rules in a clear and elementary way that can be used in further research. In addition, it provides numerous useful tables and diagrams that can be quickly and directly checked for industry applications. Furthermore, it highlights the connection between free flow and porous flow, which can aid advanced interdisciplinary research such as nanotech and environmental science. Last but not least, each chapter presents a variety of problems to offer readers a better understanding about the principles and applications of fluid mechanics. This volume arises from an International Symposium on Flow and Transport in the Natural Environment held in Canberra, Australia, in September 1987. The meeting was hosted by the CSIRO Division of Environmental Mechanics (now the Centre for Environmental Mechanics) to mark the opening of the second stage of its headquarters, the F.C. Pye Field Environment Laboratory, twenty-one years after the opening of the first stage. Those twenty-one years have seen much progress in our understanding of the physics of the natural environment and the occasion provided an ideal opportunity to review advances in our knowledge of flow and transport phenomena, particularly with regard to flow and transport in soils, plants and the atmosphere. The contents of this volume are based very closely on the Symposium's program. Undoubtedly, our choices of topics were idiosyncratic, but we believe that those we have selected exhibit progress, innovation, and much scope for practical application. Rather than being encyclopaedic, we have sought to deal with thirteen selected topics in depth. This volume contains the lectures presented at the NATO Advanced Study Institute that took place at the University of Delaware, Newark, Delaware, July 18-27, 1982. The purpose of this Institute was to provide an international forum for exchange of ideas and dissemination of knowledge on some selected topics in Mechanics of Fluids in Porous Media. Processes of transport of such extensive quantities as mass of a phase, mass of a component of a phase, momentum and/or heat occur in diversified fields, such as petroleum reservoir engineer ing, groundwater hydraulics, soil mechanics, industrial filtration, water purification, wastewater treatment, soil drainage and irri gation, and geothermal energy production. In all these areas, scientists, engineers and planners make use of mathematical models that describe the relevant transport processes that occur within porous medium domains, and enable the forecasting of the future state of the latter in response to planned activities. The mathe matical models, in turn, are based on the understanding of phenomena, often within the void space, and on theories that re late these phenomena to measurable quantities. Because of the pressing needs in areas of practical interest, such as the develop ment of groundwater resources, the control and abatement of groundwater contamination, underground energy storage and geo thermal energy production, a vast amount of research efforts in all these fields has contributed, especially in the last t~o decades, to our understanding and ability to describe transport phenomena. This text focuses on the physics of fluid transport in micro- and nanofabricated liquid-phase systems, with consideration of gas bubbles, solid particles, and macromolecules. This text was designed with the goal of bringing together several areas that are often taught separately - namely, fluid mechanics, electrodynamics, and interfacial chemistry and electrochemistry - with a focused goal of preparing the modern microfluidics researcher to analyse and model continuum fluid mechanical systems encountered when working with micro- and nanofabricated devices. This text serves as a useful reference for practising researchers but is designed primarily for classroom instruction. Worked sample problems are included throughout to assist the student, and exercises at the end of each chapter help facilitate class learning. The Third Edition Of This Book Recognises Two Important Developments That Have Taken Place In Recent Years.(1) Mathematical Modelling Of Alluvial River Processes, And(2) Environmental Aspects Relating To Sedimentation.Both Of These Factors Have Been Duly Considered In This Edition. With Its Detailed Analysis And Clear Presentation, This Book Would Be Extremely Useful For Practising Civil Engineers. It Would Also Serve As An Authoritative Reference Source For Graduate And Senior Undergraduate Civil Engineering Students. Transport Processes in Engineering is a new multidisciplinary series of books intended to provide, in an integrated fashion, authoritative and timely coverage of selected topics in fluid mechanics, heat and mass transfer. The series will publish edited works on coherent themes of current and potential application as well as monographs and advanced reference works for researchers, advanced students, practicing engineers and applied scientists. This first volume covers transport processes in several major areas of application of fluidized-bed contactors. It does not attempt to achieve an exhaustive treatment of its subject, rather it includes areas which constitute important non-conventional applications of fluidized-bed systems, offering something new even to those already well-versed in fluidization technology. The book will be of interest to engineers and technologists in the chemical, agricultural, food, mechanical, metallurgical, mineral processing and energy engineering areas with an interest in current or potential applications involving conventional and/or modified fluidized beds. This textbook provides a thorough presentation of the phenomena related to the transport of mass, momentum and energy. It lays all the basic physical principles, then for the more advanced readers, it offers an in-depth treatment with advanced mathematical derivations and ends with some useful applications of the models and equations in specific settings. The important idea behind the book is to unify all types of transport phenomena, describing them within a common framework in terms of cause and effect, respectively represented by the driving force and the flux of the transported quantity. The approach and presentation are original in that the book starts with a general description of transport processes, providing the macroscopic balance relations of fluid dynamics and heat and mass transfer, before diving into the mathematical realm of continuum mechanics to derive the microscopic governing equations at the microscopic level. The book is a modular teaching tool and can be used either for an introductory or for an advanced graduate course. The last 6 chapters will be of interest to more advanced researchers who might be interested in particular applications in physics, mechanical engineering or biomedical engineering. All chapters are complemented with exercises that are essential to complete the learning process. Sponsored by the Fluids Committee of the Engineering Mechanics Division of ASCE. This report provides environmental engineers with a comprehensive survey of recent developments in the application of fluid mechanics theories to treat environmental problems. Chapters cover principles of fluid mechanics, as well as contemporary applications to environmental problems involving river, lake, coastal, and groundwater areas. Topics include: turbulent diffusion; mixing of a turbulent jet in crossflow -- the advected line puff; multi-phase plumes in uniform, stratified, and flowing environments; turbulent transport processes across natural streams; three-dimensional hydrodynamic and salinity transport modeling in estuaries; fluid flows and reactive chemical transport in variably saturated subsurface media; heat and mass transport in porous media; parameter identification of environmental systems; finite element analysis of stratified lake hydrodynamics; water quality modeling in reservoirs; and linear systems approach to river water quality analysis In addition to providing valuable information to practitioners, this book also serves as a text for an advanced undergraduate or introductory graduate level course. Laminar Flow and Convective Transport Processes: Scaling Principles and Asymptotic Analysis presents analytic methods for the solution of fluid mechanics and convective transport processes, all in the laminar flow regime. This book brings together the results of almost 30 years of research on the use of nondimensionalization, scaling principles, and asymptotic analysis into a comprehensive form suitable for presentation in a core graduate-level course on fluid mechanics and the convective transport of heat. A considerable amount of material on viscous-dominated flows is covered. A unique feature of this book is its emphasis on scaling principles and the use of asymptotic methods, both as a means of solution and as a basis for qualitative understanding of the correlations that exist between independent and dependent dimensionless parameters in transport processes. Laminar Flow and Convective Transport Processes is suitable for use as a textbook for graduate courses in fluid mechanics and transport phenomena and also as a reference for researchers in the field. This textbook offers a superb introduction to theoretical and practical soil mechanics. Special attention is given to the risks of failure in civil engineering, and themes covered include stresses in soils, groundwater flow, consolidation, testing of soils, and stability of slopes. Readers will learn the major principles and methods of soil mechanics, and the most important methods of determining soil parameters both in the laboratory and in situ. The basic principles of applied mechanics, that are frequently used, are offered in the appendices. The author’s considerable experience of teaching soil mechanics is evident in the many features of the book: it is packed with supportive color illustrations, helpful examples and references. Exercises with answers enable students to self-test their understanding and encourage them to explore further through additional online material. Numerous simple computer programs are provided online as Electronic Supplementary Material. As a soil mechanics textbook, this volume is ideally suited to supporting undergraduate civil engineering students. “I am really delighted that your book is now published. When I “discovered” your course a few years ago, I was elated to have finally found a book that immediately resonated with me. Your approach to teaching soil mechanics is precise, rigorous, clear, concise, or in other words “crisp." My colleagues who share the teaching of Soil Mechanics 1 and 2 (each course is taught every semester) at the UMN have also adopted your book.” Emmanuel Detournay Professor at Dept. of Civil, Environmental, and Geo-Engineering, University of Minnesota, USA This book deals with energetics of transport processes, largely expressed in terms of the thermodynamics of irreversible pro cesses. Since at the present time too little is known about the molecular mechanism of transport, the present treatment is based largely on hypothetical models. Care has been taken, however, to define the crucial features of these models as generally as pos sible, so that the equations do not depend too much on hypotheti cal details. Accordingly, most equations, though developed on the basis of a mobile carrier (ferryboat) model, should apply equally to a conformational model, with an appropriate reinterpretation of the symbols. To better elucidate the essentials, the models are greatly simplified by special assumptions. Maximally, only two flows are assumed to be present in each model at one time: e. g. , two solute flows, the flow of solvent and of one solute, the flow of solvent and of heat. The simplifying assumptions may often be unreal. Hence the equations should not be applied un critically to actual mechanisms. They may at best serve as a ba sis on which the more appropriate equations may be developed. The book is not designed to give a complete kinetic analysis of the transport processes described. The kinetic equations are kept to the minimum required to describe the model concerned and to relate it to the corresponding thermodynamic equations. The in tention is to stress the close relationship between bioosmotic (transport) and biochemical processes in metabolism. This book presents the foundations of fluid mechanics and transport phenomena in a concise way. It is suitable as an introduction to the subject as it contains many examples, proposed problems and a chapter for self-evaluation. How does one deal with a moving control volume? What is the best way to make a complex biological transport problem tractable? Which principles need to be applied to solve a given problem? How do you know if your answer makes sense? This unique resource provides over two hundred well-tested biomedical engineering problems that can be used as classroom and homework assignments, quiz material and exam questions. Questions are drawn from a range of topics, covering fluid mechanics, mass transfer and heat transfer applications. Driven by the philosophy that mastery of biotransport is learned by practice, these problems aid students in developing the key skills of determining which principles to apply and how to apply them. Each chapter starts with basic problems and progresses to more difficult questions. Lists of material properties, governing equations and charts provided in the appendices make this a fully self-contained work. Solutions are provided online for instructors. "Intended for graduate and undergraduate students and as a reference for practicing researchers, this text focuses on the physics of fluid transport in micro- and nanofabricated systems"--Provided by publisher.