Hydrodynamic Instabilities And The Transition To Turbulence Topics In Applied Physics

Topological Fluid Mechanics International Union of Theoretical and Applied Mechanics 1990-04-12 There has been developing interest in the aspects of fluid mechanics and of magnetohydrodynamics that can be properly described as topological, rather than exclusively analytical in character. This book contains the proceedings of the IUTAM symposium on Topological Fluid Mechanics held at Cambridge UK, 13-18 August, 1989. Topics covered include the kinematic and dynamical problems in laminar and turbulent flows, as well as the range of problems that arise from the magnetohydrodynamics of highly conducting flows. The papers presented cover all approaches; theoretical, computational and experimental, and each paper has been edited by a member of the International Scientific Committee.

Complex Systems Terry R. J. Bossomaier 2000-07-06 This book, first published in 2000, explores the exciting field of complexity.

Photon Correlation Techniques in Fluid Mechanics E.O. Schulz-Dubois 2013-06-29 Photon correlation is a kind of spectroscopy designed to identify optical frequency shifts and line-broadening effects in the range of many MHz down to a few Hz. The optical intensity is measured in terms of single photon detection events which result in current pulses at the output of photomulti plier tubes. This signal is processed in real time in a special-purpose paral lel processor known as a correlator. The resulting photon correlation func tion, a function in the time domain, contains the desired spectral informa tion, which may be extracted by a suitable algorithm. Due to the non-intrusive nature and the sound theoretical basis of photon correlation, the phenomena under study are not disturbed, and the parameters in question can be precisely evaluated. For these reasons photon correlation has become a valuable and in many instances indispensable technique in two distinct fields. One of these is velocimetry in fluid flow. This includes hydro- and aerodynamic processes in liquids, gases, or flames where the velo city field may be stationary, time periodic, or turbulent, and may range from micrometers per second for motion inside biological cells to one kilometer per second for supersonic flow. The other major field is stochastic particle propagation due to Brownian motion.

Stochastic and Chaotic Oscillations Juri I. Neimark 2012-12-06 This volume is devoted to stochastic and chaotic oscillations in dissipative systems. Chapter 1 deals with mathematical models of deterministic, discrete and distributed dynamical systems. In Chapter 2, the two basic trends of order and chaos are considered. The next three chapters describe stochasticity transformers, amplifiers and generators, turbulence, and phase portraits of steady-state motions and their bifurcations. Chapter 6 treats the topics of stochastic and chaotic attractors, and this is followed by two chapters dealing with routes to chaos and the quantitative characteristics of stochastic and chaotic motions. Finally, Chapter 9, which comprises more than one-third of the book, presents examples of systems having chaotic and stochastic motions drawn from mechanical, physical, chemical and biological systems. The book concludes with a comprehensive bibliography. For mathematicians, physicists, chemists and biologists interested in stochastic and chaotic oscillations in dynamical systems.

Hydrodynamic Instabilities and the Transition to Turbulence H. L. Swinney 1981

Dimensions and Entropies in Chaotic Systems Gottfried Mayer-Kress 2012-12-06 These proceedings contain the papers contributed to the International Work shop on "Dimensions and Entropies in Chaotic Systems" at the Pecos River Conference Center on the Pecos River Ranch in Spetember 1985. The work shop was held by the Center for Nonlinear Studies of the Los Alamos National Laboratory. At the Center for Nonlinear Studies the investigation of chaotic dynamics and especially the quantification of complex behavior has a long tradition. In spite of some remarkable

successes, there are fundamental, as well as nu merical, problems involved in the practical realization of these algorithms. This has led to a series of publications in which modifications and improve ments of the original methods have been proposed. At present there exists a growing number of competing dimension algorithms but no comprehensive review explaining how they are related. Further, in actual experimental ap plications, rather than a precise algorithm, one finds frequent use of "rules of thumb" together with error estimates which, in many cases, appear to be far too optimistic. Also it seems that questions like "What is the maximal dimension of an attractor that one can measure with a given number of data points and a given experimental resolution?" have still not been answered in a satisfactory manner for general cases.

Solitons in Mathematics and Physics Alan C. Newell 1985-06-01 A discussion of the soliton, focusing on the properties that make it physically ubiquitous and the soliton equation mathematically miraculous.

Advances in Turbulence Genevieve Comte-Bellot 2012-12-06 Since 1964 the main function of the European Mechanics Committee has been to arrange Euromech Colloquia. These are three- or four-day meetings for the discussion of current research on a specified and relatively narrow topic in mechanics, by about 50 specialists chosen for their active involvement in research in that topic. The organization of each Euromech Colloquium is entrusted by the Committee to one or two selected scientists of repute in the field, and these organizers are enjoined to achieve a friendly and informal forum for discussion, with a minimum of paper work and expenditure. Over 220 Euromech Colloquia have been held since 1964 (about 40 each in France, West Germany and Britain and the remainder in 18 countries in both western and eastern Europe) on a wide range of topics drawn from the mechanics of solid materials, hydrodynamics, gas dynamics and mechanical systems. The Committee believes that collectively, Euromech Colloquia have made a significant contribution to the exchange of ideas on topics in mechanics within Europe and have thereby helped to overcome the barriers to easy scientific communication in that sorely divided continent. A few years ago the European Mechanics Committee turned its atten tion to the possible need for European conferences on a larger scale than Euromech Colloquia.

Physics of Transitional Shear Flows Andrey V. Boiko 2011-09-15 Starting from fundamentals of classical stability theory, an overview is given of the transition phenomena in subsonic, wall-bounded shear flows. At first, the consideration focuses on elementary small-amplitude velocity perturbations of laminar shear layers, i.e. instability waves, in the simplest canonical configurations of a plane channel flow and a flat-plate boundary layer. Then the linear stability problem is expanded to include the effects of pressure gradients, flow curvature, boundary-layer separation, wall compliance, etc. related to applications. Beyond the amplification of instability waves is the non-modal growth of local stationary and non-stationary shear flow perturbations which are discussed as well. The volume continues with the key aspect of the transition process, that is, receptivity of convectively unstable shear layers to external perturbations, summarizing main paths of the excitation of laminar flow disturbances. The remainder of the book addresses the instability phenomena found at late stages of transition. These include secondary instabilities and nonlinear features of boundary-layer perturbations that lead to the final breakdown to turbulence. Thus, the reader is provided with a step-by-step approach that covers the milestones and recent advances in the laminar-turbulent transition. Special aspects of instability and transition are discussed through the book and are intended for research scientists, while the main target of the book is the student in the fundamentals of fluid mechanics. Computational guides, recommended exercises, and PowerPoint multimedia notes based on results of real scientific experiments supplement the monograph. These are especially helpful for the neophyte to obtain a solid foundation in hydrodynamic stability. To access the supplementary material go to extras.springer.com and type in the ISBN for this volume.

Mathematical Geoscience Andrew Fowler 2011-06-21 Mathematical Geoscience is an expository textbook which aims to provide a

comprehensive overview of a number of different subjects within the Earth and environmental sciences. Uniquely, it treats its subjects from the perspective of mathematical modelling with a level of sophistication that is appropriate to their proper investigation. The material ranges from the introductory level, where it can be used in undergraduate or graduate courses, to research questions of current interest. The chapters end with notes and references, which provide an entry point into the literature, as well as allowing discursive pointers to further research avenues. The introductory chapter provides a condensed synopsis of applied mathematical techniques of analysis, as used in modern applied mathematical modelling. There follows a succession of chapters on climate, ocean and atmosphere dynamics, rivers, dunes, landscape formation, groundwater flow, mantle convection, magma transport, glaciers and ice sheets, and sub-glacial floods. This book introduces a whole range of important geoscientific topics in one single volume and serves as an entry point for a rapidly expanding area of genuine interdisciplinary research. By addressing the interplay between mathematics and the real world, this book will appeal to graduate students, lecturers and researchers in the fields of applied mathematics, the environmental sciences and engineering.

Dissipative Structures and Weak Turbulence 2014-06-28 Dissipative Structure and Weak Turbulence provides an understanding of the emergence and evolution of structures in macroscopic systems. This book discusses the emergence of dissipative structures. Organized into 10 chapters, this book begins with an overview of the stability of a fluid layer with potentially unstable density stratification in the field of gravity. This text then explains the theoretical description of the dynamics of a given system at a formal level. Other chapters consider several examples of how such simplified models can be derived, complicating the picture progressively to account for other phenomena. This book discusses as well the theory and experiments on plain Rayleigh–Bénard convection by setting first the theoretical frame and deriving the analytical solution of the marginal stability problem. The final chapter deals with building a bridge between chaos as studied in weakly confined systems and more advanced turbulence in the most conventional sense. This book is a valuable resource for physicists.

An Exploration of Dynamical Systems and Chaos John H. Argyris 2015-04-24 This book is conceived as a comprehensive and detailed text-book on non-linear dynamical systems with particular emphasis on the exploration of chaotic phenomena. The self-contained introductory presentation is addressed both to those who wish to study the physics of chaotic systems and non-linear dynamics intensively as well as those who are curious to learn more about the fascinating world of chaotic phenomena. Basic concepts like Poincaré section, iterated mappings, Hamiltonian chaos and KAM theory, strange attractors, fractal dimensions, Lyapunov exponents, bifurcation theory, self-similarity and renormalisation and transitions to chaos are thoroughly explained. To facilitate comprehension, mathematical concepts and tools are introduced in short sub-sections. The text is supported by numerous computer experiments and a multitude of graphical illustrations and colour plates emphasising the geometrical and topological characteristics of the underlying dynamics. This volume is a completely revised and enlarged second edition which comprises recently obtained research results of topical interest, and has been extended to include a new section on the basic concepts of probability theory. A completely new chapter on fully developed turbulence presents the successes of chaos theory, its limitations as well as future trends in the development of complex spatio-temporal structures. "This book will be of valuable help for my lectures" Hermann Haken, Stuttgart "This text-book should not be missing in any introductory lecture on non-linear systems and deterministic chaos" Wolfgang Kinzel, Würzburg “This well written book represents a comprehensive treatise on dynamical systems. It may serve as reference book for the whole field of nonlinear and chaotic systems and reports in a unique way on scientific developments of recent decades as well as important applications.” Joachim Peinke, Institute of Physics, Carl-von-Ossietzky University Oldenburg, Germany

Hydrodynamic Instability and Transition to

Turbulence Akiva M. Yaglom 2012-12-18 This book is a complete revision of the part of Monin & Yaglom's famous two-volume work "Statistical Fluid Mechanics: Mechanics of Turbulence" that deals with the theory of laminar-flow instability and transition to turbulence. It includes the considerable advances in the subject that have been made in the last 15 years or so. It is intended as a textbook for advanced graduate courses and as a reference for research students and professional research workers. The first two Chapters are an introduction to the mathematics, and the experimental results, for the instability of laminar (or inviscid) flows to infinitesimal (in practice "small") disturbances. The third Chapter develops this linear theory in more detail and describes its application to particular problems. Chapters 4 and 5 deal with instability to finite-amplitude disturbances: much of the material has previously been available only in research papers.

Bifurcation and Symmetry BÖHMER 2013-03-08 Symmetry is a property which occurs throughout nature and it is therefore natural that symmetry should be considered when attempting to model nature. In many cases, these models are also nonlinear and it is the study of nonlinear symmetric models that has been the basis of much recent work. Although systematic studies of nonlinear problems may be traced back at least to the pioneering contributions of Poincare, this remains an area with challenging problems for mathematicians and scientists. Phenomena whose models exhibit both symmetry and nonlinearity lead to problems which are challenging and rich in complexity, beauty and utility. In recent years, the tools provided by group theory and representation theory have proven to be highly effective in treating nonlinear problems involving symmetry. By these means, highly complex situations may be decomposed into a number of simpler ones which are already understood or are at least easier to handle. In the realm of numerical approximations, the systematic exploitation of symmetry via group repre sentation theory is even more recent. In the hope of stimulating interaction and acquaintance with results and problems in the various fields of applications, bifurcation theory and numerical analysis, we organized the conference and workshop Bifurcation and Symmetry: Cross Influences between Mathematics and Applications during June 2-7,8-14, 1991 at the Philipps University of Marburg, Germany.

Constructive Modeling of Structural Turbulence and Hydrodynamic Instabilities Oleg Mikha?lovich Belot?serkovski? 2009 The book provides an original approach in the research of structural analysis of free developed shear compressible turbulence at high Reynolds number on the base of direct numerical simulation (DNS) and instability evolution for ideal medium (integral conservation laws) with approximate mechanism of dissipation (FLUX dissipative monotone ?upwind? difference schemes) and does not use any explicit sub-grid approximation and semi-empirical models of turbulence. Convective mixing is considered as a principal part of conservation law.Appropriate hydrodynamic instabilities (free developed shear turbulence) are investigated from unique point of view. It is based on the concept of large ordered structures with stochastic core of small scale developed turbulence (?turbulent spot?). Decay of ?turbulent spot? are simulated by Monte Carlo method. Proposed approach is based on two hypotheses: statistical independence of the characteristic of large ordered structures (LOS) and small-scale turbulence (ST) ?and? weak influence of molecular viscosity (or more generally, dissipative mechanism) on properties of large ordered structures.Two versions of instabilities, due to Rayleigh-Taylor and Richtmyer-Meshkov are studied detail by the three-dimensional calculations, extended to the large temporal intervals, up to turbulent stage and investigation turbulent mixing zone (TMZ).The book covers both the fundamental and practical aspects of turbulence and instability and summarizes the result of numerical experiments conducted over 30 years period with direct participation of the author.In the book are cited the opinions of the leading scientists in this area of research: Acad. A S Monin (Russia), Prof. Y Nakamura (Japan, Nagoya University) and Prof. F Harlow (USA, Los-Alamos).

Internal Flow E. M. Greitzer 2007-02-26 This book describes the analysis and behaviour of internal flows encountered in propulsion

systems, fluid machinery (compressors, turbines and pumps) and ducts (diffusers, nozzles and combustion chambers). The focus is on phenomena that are important in setting the performance of a broad range of fluid devices. The authors show that even for complex processes one can learn a great deal about the behaviour of such devices from a clear understanding and rigorous use of basic principles. Throughout the book they illustrate theoretical principles by reference to technological applications. The strong emphasis on fundamentals, however, means that the ideas presented can be applied beyond internal flow to other types of fluid motion. The book equips students and practising engineers with a range of new analytical tools. These tools offer enhanced interpretation and application of both experimental measurements and the computational procedures that characterize modern fluids engineering.

Astronomy and Astrophysics 1983

Hydrodynamics and Nonlinear Instabilities Claude Godrèche 2005-07-21 This book presents five sets of pedagogical lectures by internationally respected researchers on nonlinear instabilities and the transition to turbulence in hydrodynamics. The book begins with a general introduction to hydrodynamics covering fluid properties, flow measurement, dimensional analysis and turbulence. Chapter two reviews the special characteristics of instabilities in open flows. Chapter three presents mathematical tools for multiscale analysis and asymptotic matching applied to the dynamics of fronts and localized nonlinear states. Chapter four gives a detailed review of pattern forming instabilities. The final chapter provides a detailed and comprehensive introduction to the instability of flames, shocks and detonations. Together, these lectures provide a thought-provoking overview of current research in this important area.

Physics of Rotating Fluids Christoph Egbers 2008-01-11 This book is devoted to recent developments in the field of rotating fluids, in particular the study of Taylor--Couette flow, spherical Couette flow, planar Couette flow, as well as rotating annulus flow. Besides a comprehensive overview of the current state of the art, possible future directions in this research field are investigated. The first part of this volume presents several new results in the classical Taylor--Couette system covering diverse theoretical, experimental and numerical work on bifurcation theory, influence of boundary conditions, counter-rotating flows, spiral vortices and many others. The second part focuses on spherical Couette flows, including isothermal flows, thermal convective motion, as well as magnetohydrodynamics in spherical shells. The remaining parts are devoted to Goertler vortices, rotating annulus flows, as well as superfluid Couette flows. The present book will be of interest to all researchers and graduate students working actively in the field.

Evolution of Spontaneous Structures in Dissipative Continuous Systems Friedrich H. Busse 2003-07-01 In the decades the of the formation of structures past subject spontaneous in far from has into a branch of - systems equilibrium major physics grown search with ties to It has become evident that strong neighboring disciplines. a diverse of can be understood within a common mat- phenomena range matical framework which has been called nonlinear of continuous dynamics This name the close to the field of nonlinear systems. emphasizes relationship of with few of freedom which has evolved into a dynamics systems degrees mature in the recent features mathematically subject past. Many dynamical of continuous be described reduction few can a to a systems actually through of freedom and of the latter of continue to degrees properties type systems of continuous the inspire study systems. The of this book is to demonstrate the numerous goal through examples that exist for the of nonlinear the opportunities study phenomena through tools of mathematical and use of common analyses dynamical interpretations. Instead of overview of the a providing comprehensive rapidly evolving field, the contributors to this book are to communicate to a wide scientific trying audience the of what have learnt about the formation of essence they spon- neous structures in continuous and about the dissipative systems competition between order and chaos that characterizes these It is that systems. hoped the book will be even to those scientists whose not helpful are disciplines the authors.

Instabilities of Flows and Transition to Turbulence Tapan K. Sengupta 2012-04-24 This book covers material ranging from classical hydrodynamic instability to contemporary research areas, including bluff body flow instability and mixed convection flows. It also examines applications in aerospace and other branches of engineering such as fluid mechanics. The author addresses classical material as well as new perspectives and presents comprehensive coverage of receptivity to complement the instability material. This book presents a concise, up-to-date treatment of theory and applications of viscous flow instability, providing both current knowledge and techniques.

Chemical Oscillations, Waves, and Turbulence Y. Kuramoto 2012-12-06 Tbis book is intended to provide a few asymptotic methods which can be applied to the dynamics of self-oscillating fields of the reaction-diffusion type and of some related systems. Such systems, forming cooperative fields of a large num of interacting similar subunits, are considered as typical synergetic systems. ber Because each local subunit itself represents an active dynamical system function ing only in far-from-equilibrium situations, the entire system is capable of showing a variety of curious pattern formations and turbulencelike behaviors quite unfamiliar in thermodynamic cooperative fields. I personally believe that the nonlinear dynamics, deterministic or statistical, of fields composed of similar active (Le., non-equilibrium) elements will form an extremely attractive branch of physics in the near future. For the study of non-equilibrium cooperative systems, some theoretical guid ing principle would be highly desirable. In this connection, this book pushes for ward a particular physical viewpoint based on the slaving principle. The dis covery of tbis principle in non-equilibrium phase transitions, especially in lasers, was due to Hermann Haken. The great utility of this concept will again be dem onstrated in tbis book for the fields of coupled nonlinear oscillators.

Perspectives of Nonlinear Dynamics: Volume 2 E. Atlee Jackson 1989 The dynamics of physical, chemical, biological or fluid systems generally must be described by nonlinear models, whose detailed mathematical solutions are not obtainable. To understand some aspects of such dynamics, various complementary methods and viewpoints are of crucial importance. The presentation and style is intended to stimulate the reader's imagination to apply these methods to a host of problems and situations.

Introduction to Hydrodynamic Stability P. G. Drazin 2002-09-09 Instability of flows and their transition to turbulence are widespread phenomena in engineering and the natural environment, and are important in applied mathematics, astrophysics, biology, geophysics, meteorology, oceanography and physics as well as engineering. This is a textbook to introduce these phenomena at a level suitable for a graduate course, by modelling them mathematically, and describing numerical simulations and laboratory experiments. The visualization of instabilities is emphasized, with many figures, and in references to more still and moving pictures. The relation of chaos to transition is discussed at length. Many worked examples and exercises for students illustrate the ideas of the text. Readers are assumed to be fluent in linear algebra, advanced calculus, elementary theory of ordinary differential equations, complex variables and the elements of fluid mechanics. The book is aimed at graduate students but will also be very useful for specialists in other fields.

Advances in Turbulence Jean Mathieu 1987 Since 1964 the main function of the European Mechanics Committee has been to arrange Euromech Colloquia. These are three- or four-day meetings for the discussion of current research on a specified and relatively narrow topic in mechanics, by about 50 specialists chosen for their active involvement in research in that topic. The organization of each Euromech Colloquium is entrusted by the Committee to one or two selected scientists of repute in the field, and these organizers are enjoined to achieve a friendly and informal forum for discussion, with a minimum of paper work and expenditure. Over 220 Euromech Colloquia have been held since 1964 (about 40 each in France, West Germany and Britain and the remainder in 18 countries in both western and eastern Europe) on a wide range of topics drawn from the mechanics of solid materials, hydrodynamics, gas dynamics

and mechanical systems. The Committee believes that collectively, Euromech Colloquia have made a significant contribution to the exchange of ideas on topics in mechanics within Europe and have thereby helped to overcome the barriers to easy scientific communication in that sorely divided continent. A few years ago the European Mechanics Committee turned its atten tion to the possible need for European conferences on a larger scale than Euromech Colloquia.

Instability and Transition M.Y. Hussaini 2012-12-06 The ability to predict and control viscous flow phenomena is becoming increasingly important in modern industrial application. The Instability and Transition Workshop at Langley was extremely important in help§ ing the scientists community to access the state of knowledge in the area of transition from laminar to turbulent flow, to identify promising future areas of research and to build future interactions between researchers worldwide working in the areas of theoretical, experimental and computational fluid and aero dynamics. The set of two volume contains panel discussions and research contribution with the following objectives: (1) expose the academic community to current technologically important issues of instability and transitions in shear flows over the entire speed range, (2) acquaint the academic community with the unique combination of theoretical, computational and experimental capabilities at LaRC and foster interaction with these facilities. (3) review current state-of-the-art and propose future directions for instability and transition research, (4) accelerate progress in elucidating basic understanding of transition phenomena and in transferring this knowledge into improved design methodologies through improved transition modeling, and (5) establish mechanism for continued interaction.

Difference Equations and Their Applications A.N. Sharkovsky 1993-03-31 The theory of difference equations is now enjoying a period of Renaissance. Witness the large number of papers in which problems, having at first sight no common features, are reduced to the investigation of subsequent iterations of the maps f· IR. m ~ IR. m, m > 0, or (which is, in fact, the same) to difference equations The world of difference equations, which has been almost hidden up to now, begins to open in all its richness. Those experts, who usually use differential equations and, in fact, believe in their universality, are now discovering a completely new approach which re sembles the theory of ordinary differential equations only slightly. Difference equations, which reflect one of the essential properties of the real world-its discreteness-rightful ly occupy a worthy place in mathematics and its applications. The aim of the present book is to acquaint the reader with some recently discovered and (at first sight) unusual properties of solutions for nonlinear difference equations. These properties enable us to use difference equations in order to model complicated os cillating processes (this can often be done in those cases when it is difficult to apply ordinary differential equations). Difference equations are also a useful tool of syn ergetics-an emerging science concerned with the study of ordered structures. The application of these equations opens up new approaches in solving one of the central problems of modern science-the problem of turbulence.

Fluctuations and Sensitivity in Nonequilibrium Systems W. Horsthemke 2012-12-06 This volume contains the invited lectures and a selection of the contributed papers and posters of the workshop on "Fluctuations and Sensitivity in Nonequil ibrium Systems", held at the Joe C. Thompson Conference Center, Un i vers ity of Texas at Austin, March 12-16, 1984. The workshop dealt with stochastic phenomena and sensi tivity in nonequilibrium systems from a macroscopic point of view. Durin9 the last few years it has been realized that the role of fluctuations is far less trivial in systems far from equilibrium than in systems under thermodynamic equilibrium condi tions. It was found that random fluctuations often are a determining factor for the state adopted by macroscopic systems and cannot be regarded as secondary effects of minor importance. Further, nonequilibrium systems are also very sensitive to small systematic changes in their environment. The main aims of the workshop were: i) to provide scientists with an occasion to acquaint themselves with the state of the art in fluctuation theory and sensitivity analysis; ii) to provide a forum for the presentation of recent advances in theory and experiment; iii) to bring

toge ther theoreticians and experimentalists in order to delineate the major open problems and to formulate strategies to tackle these problems. The organizing committee of the workshop consisted of W. Horsthemke, O.K. Konde pudi, G. Dewel, G. Nicolis, I. Prigogine and L. Reichl.

NASA Technical Memorandum 1984

Theoretical and Applied Rheology P. Moldenaers 2013-10-22 More than 900 authors from over 35 countries contributed to the 1992 International Congress on Rheology. These proceedings volumes comprise 17 plenary and keynote papers, 250 oral contributions and some 200 poster presentations. All relevant aspects of rheology are covered, e.g., theoretical rheology, molecular theories, fluid mechanics, rheometry, experimental methods, foams, polymer solutions, polymer melts, rubber, solids, composites, biorheology, industrial rheology, polymer processing, food rheology and electrorheology, reflecting the development of rheology into a broad, multidisciplinary field of recognized academic and industrial relevance.

Stability and Transition in Shear Flows Peter J. Schmid 2012-12-06 The field of hydrodynamic stability has a long history, going back to Rey nolds and Lord Rayleigh in the late 19th century. Because of its central role in many research efforts involving fluid flow, stability theory has grown into a mature discipline, firmly based on a large body of knowledge and a vast body of literature. The sheer size of this field has made it difficult for young researchers to access this exciting area of fluid dynamics. For this reason, writing a book on the subject of hydrodynamic stability theory and transition is a daunting endeavor, especially as any book on stability theory will have to follow into the footsteps of the classical treatises by Lin (1955), Betchov & Criminale (1967), Joseph (1971), and Drazin & Reid (1981). Each of these books has marked an important development in stability theory and has laid the foundation for many researchers to advance our understanding of stability and transition in shear flows.

Advanced Synergetics Hermann Haken 2012-12-06 This text on the interdisciplinary field of synergetics will be of interest to students and scientists in physics, chemistry, mathematics, biology, electrical, civil and mechanical engineering, and other fields. It continues the outline of basic con cepts and methods presented in my book Synergetics. An Introduction, which has by now appeared in English, Russian, J apanese, Chinese, and German. I have written the present book in such a way that most of it can be read in dependently of my previous book, though occasionally some knowledge of that book might be useful. But why do these books address such a wide audience? Why are instabilities such a common feature, and what do devices and self-organizing systems have in common? Self-organizing systems acquire their structures or functions without specific interference from outside. The differentiation of cells in biology, and the process of evolution are both examples of self-organization. Devices such as the electronic oscillators used in radio transmitters, on the other hand, are man made. But we often forget that in many cases devices function by means of pro cesses which are also based on self-organization. In an electronic oscillator the motion of electrons becomes coherent without any coherent driving force from the outside; the device is constructed in such a way as to permit specific collective motions of the electrons. Quite evidently the dividing line between self-organiz ing systems and man-made devices is not at all rigid.

Perspectives of Nonlinear Dynamics: Volume 1 E. Atlee Jackson 1989 The dynamics of physical, chemical, biological, or fluid systems generally must be described by nonlinear models, whose detailed mathematical solutions are not obtainable. To understand some aspects of such dynamics, various complementary methods and viewpoints are of crucial importance. In this book the perspectives generated by analytical, topological and computational methods, and interplays between them, are developed in a variety of contexts. This book is a comprehensive introduction to this field, suited to a broad readership, and reflecting a wide range of applications. Some of the concepts considered are: topological equivalence; embeddings; dimensions and fractals; Poincaré maps and map-dynamics; empirical computational sciences vis-á-vis mathematics; Ulam's synergetics; Turing's instability and dissipative structures; chaos; dynamic entropies; Lorenz and Rossler models;

predator-prey and replicator models; FPU and KAM phenomena; solitons and nonsolitons; coupled maps and pattern dynamics; cellular automata.

Deformation of Glacial Materials Alex Maltman 2000 The flow of glacier ice can produce structures that are striking and beautiful. Associated sediments too can develop spectacular deformation structures, and examples are remarkably well preserved in Quaternary deposits. This collection of papers addresses how the methods for unravelling deformation structures evolved by structural geologists can be used for glacial materials, and the opportunities offered to structural geologists by glacial materials for studying deformation in rocks.

Engineering Applications of Dynamics of Chaos W. Szemplinska-Stupnicka 2014-05-04 The treatment of chaotic dynamics in mathematics and physics during last two decades has led to a number of new concepts for the investigation of complex behavior in nonlinear dynamical processes. The aim the CISM course Engineering Applications of Dynamics of Chaos of which this is the proceedings volume was to make these concepts available to engineers and applied scientists possessing only such modest knowledges in mathematics which are usual for engineers, for example graduating from a Technical University. The contents of the articles contributed by leading experts in this field cover not only theoretical foundations and algorithmic and computational aspects but also applications to engineering problems. In the first article an introduction into the basic concepts for the investigation of chaotic behavior of dynamical systems is given which is followed in the second article by an extensive treatment of approximative analytical methods to determine the critical parameter values describing the onset of chaos. The important relation between chaotic dynamics and the phenomenon of turbulence is treated in the third article by studying instabilities various fluid flows. In this contribution also an introduction into interesting phenomenon of pattern formation is given. The fourth and fifth articles present various applications to nonlinear oscillations including roll motions of ships, rattling oscillations in gear boxes, tumbling oscillations of satellites, flutter motions of fluid carrying pipes and vibrations of robot arms. In the final article a short treatment of hyperchaos is given.

Physics of Bioenergetic Processes L. A. Blumenfeld 2012-12-06 According to its definition, synergetics is concerned with the cooperation of indi vidual parts of a system that produces macroscopic temporal, spatial or functional structures. A good deal of the volumes published within this series dealt with the formation of truly macroscopic structures which we can s. ee with our eyes. A common scheme could be developed to understand the formation of many patterns through self-organization. In particular, we have to use concepts which go beyond conventio nal thermodynamics. New ideas became crucial. We have to study kinetic processes, and often few highly excited degrees of freedom play the decisive role in the evo lution of structures. Over the past years it has turned out that quite similar lines of approach apply to a world which at first sight would be classified as "microsco pic". That world consists of processes in which biomolecules are involved. An impor tant example for the problems occurring there is provided by Manfred Eigen's theory of evolution of life at the molecular level (cf. his contribution to Volume 17 of this series). Another important example has been provided by Blumenfeld's book on problems of biological physics (Vol. 7 of this series). There it was proposed to treat biological molecules as machines which, in a certain sense, work through "macros copic" degrees of freedom.

Fluids and Plasmas: Geometry and Dynamics Jerrold E. Marsden 1984 "The organizing committee envisioned bringing together three groups of people working on the following topics in fluid and plasma dynamics: 1. Geometric aspects : Hamiltonian structures, perturbation theory and nonlinear stability by variational methods, 2) Analytical and numerical methods: contour dynamics, spectral methods, and functional analytic techniques, 3) Dynamical systems aspects: experimental and numerical methods, bifurcation theory, and chaos."- introduction

Advances In Turbulence Stanley Corrsin 1988-10-01 Based on a symposium held in June 1986 in Minneapolis, USA, this volume surveys current information on turbulence measurement

and modelling, computational fluid mechanics, vortex flow and physical modelling, cavitation and two-phase flow, bluff body flow and fluid structure interaction.

Instabilities and Nonequilibrium Structures III E. Tirapegui 2012-12-06 Proceedings of the 3rd Workshop on Instabilities and Nonequilibrium Structures

Nonlinear Phenomena in Chemical Dynamics C. Vidal 2012-12-06 An international conference. titled Nonlinear Phenomena in Chemical Dynamics was held in Bordeaux on September 7-11, 1981. The present volume contains the text of lectures and abstracts of posters presented during the meeting. This conference is part of a series of scientific multidisciplinary meetings in which chemistry is involved at various levels. Amongst the most recent ones let us mention Aachen 1979, Bielefeld 1979, New York 1979, Elmau 1981. In addition, this meeting is a direct extension of the first one that took place in Bordeaux in 1978 on the topic "Far from equilibrium: instabilities and structures," at the conclusions of which we could write (cf. Far fram Equilibrium, Springer Series in Synergetics, Vol. 3): "The three key words, far fram equilibriUm, instabilities and structuPes, best illustrate the new concepts which emerge from the description of the dynamics of various systems relevant to many different research areas. " The present proceedings show how much these remarks have remained true, even though substantial progress has been achieved during the three last years. To get a ,deeper experimental knowledge of open reacting systems, to model and simulate reaction-diffusion systems, to develop the mathematical theory of dynamical sys tems, these are the main direction~ in current investigations.

Hydrodynamic Instabilities And The Transition To Turbulence Topics In Applied Physics

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