Dynamo And Dynamics A Mathematical Challenge

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Advances in Nonlinear Dynamos - Antonio Ferriz-Mas 2019-07-17
Nonlinear dynamo theory is central to understanding the magnetic structures of planets, stars and galaxies. In chapters contributed by some of the leading scientists in the field, this text explores some of the recent advances in the field. Both kinetic and dynamic approaches to the subject are considered, including fast dynamos, topological methods in dynamo theory, physics of the solar cycle and the fundamentals of mean field dynamo. Advances in Nonlinear Dynamos is ideal for graduate students and researchers in theoretical astrophysics and applied mathematics, particularly those interested in cosmic magnetism and related topics, such as turbulence, convection, and more general nonlinear physics.

Fluid Dynamics and Dynamos in Astrophysics and Geophysics - Andrew M. Soward 2005-03-16
The increasing power of computer resources along with great improvements in observational data in recent years have led to some remarkable and rapid advances in astrophysical fluid dynamics. The subject spans three distinct but overlapping communities whose interests focus on (1) accretion discs and high-energy astrophysics; (2) solar, stellar, and galactic magnetic fields; and (3) the geodynamo, planetary magnetic fields, and associated experiments. This book grew out of a special conference sponsored by the London Mathematical Society with the support of EPSRC that brought together leading researchers in all of these areas to exchange ideas and review the status of the field. The many interesting problems addressed in this volume concern:

Index of Conference Proceedings - British Library. Document Supply Centre 2001

World Meetings - 2000-07

Large-scale Structures and Their Role in Solar Activity - National Solar Observatory/Sacramento Peak. Workshop 2005

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World Meetings Outside U.S.A. and Canada - 2000

Advanced Solar Polarimetry - National Solar Observatory/Sacramento Peak. Summer Workshop 2001
Annotation This proceedings volume of the September 2000 workshop presents recent developments in spectropolarimetry and the measurement of solar magnetic fields using the Zeeman and Hanle effects. The 67 papers address new instrumentation for telescopes, weak polarization and coronal magnetic fields, infrared polarimetry and the physics of active regions, magnetohydrodynamic (MHD) simulations, high resolutions polarimetry and the physics of flux tubes, and the analysis of Stokes profiles. No subject index. Annotation c. Book News, Inc., Portland, OR (booknews.com)

Handbook of Mathematical Fluid Dynamics - S. Friedlander 2003-03-27
The Handbook of Mathematical Fluid Dynamics is a compendium of essays that provides a survey of the major topics in the subject. Each article traces developments, surveys the results of the past decade, discusses the current state of knowledge and presents major future directions and open problems. Extensive bibliographic material is provided. The book is intended to be useful both to experts in the field and to mathematicians and other scientists who wish to learn about or begin research in mathematical fluid dynamics. The Handbook illuminates an exciting subject that involves rigorous mathematical theory applied to an important physical problem, namely the motion of fluids.

Philosophical Transactions - 2002

American Book Publishing Record - 2001

Large-Scale Perturbations of Magnetohydrodynamic Regimes - Vladislav Zheligovsky 2011-06-28
New developments for hydrodynamical dynamo theory have been spurred by recent evidence of self-sustained dynamo activity in laboratory experiments with liquid metals. The emphasis in the present volume is on the introduction of powerful mathematical techniques required to tackle modern multiscale analysis of continous systems and there application to a number of realistic model geometries of increasing complexity. This introductory and self-contained research monograph summarizes the theoretical state-of-the-art to which the author has made pioneering contributions.

Earth's Core and Lower Mantle - C.A. Jones 2003-06-26
Scientists have made new inroads in the study of the Earth's deep interior. They have forged developments in this fascinating arena using experimental and observational techniques,. including seismology, monitoring of the Earth's rotation, geomagnetism, and accurate measurements of Earth's gravity fields. These techniques along with more theoretica

Mathematical Reviews - 2007

Modelling of Stellar Atmospheres - International Astronomical Union. Symposium 2003

Stability Analysis of Convection in a Laboratory Dynamo Experiment - Angela J. Pignotti 2002

Self-Exciting Fluid Dynamos - Keith Moffatt 2019-04-25
Treats the origin of magnetic fields in planets, stars and galaxies, and the manner of their evolution over time.

Dynamo and Dynamics, a Mathematical Challenge - Pascal Chossat 2001-07-31
This book contains the lectures given at the workshop "Dynamo and dynamics, a mathematical challenge" held in Cargese from August 21 to 26, 2000. The workshop differed from most previous conferences on the dynamo effect in two important respects. First, it was at this international conference that the experimental observation of homogeneous fluid dynamos was first reported. Second, the conference gathered scientists from very different fields, thus showing that thepynamo problem has become an interdisciplinary subject involving not only astrophysicists and geophysicists, but also scientists working in dynamical systems theory, hydrodynamics, and numerical simulation, as well as several groups in experimental physics. This book thus reports important results on various dynamo studies in these different contexts: - Decades after

the discovery of the first analytic examples of laminar fluid dynamos, the self-generation of a magnetic field by a flow ofliquid sodium has been reported by the Karlsruhe and Riga groups. Although there were no doubts concerning the self generation by the laminar Roberts-type or Ponomarenko-type flows that were used, these experiments have raised interesting questions about the influence of the turbulent fluctuations on the dynamo threshold and on the saturation level of the magnetic field.

MHD Couette Flows - Robert Rosner 2004-11-19
All papers were peer reviewed. The importance of connecting astrophysical theory, simulations and laboratory experiments is enormous. In particular it is widely understood that laboratory experiments are the key ingredients for validating astrophysical codes. This understanding is particularly acute in the area of magneto-rotational instability (MRI) research. This book witnesses the vigorous discussions that groups of experimentalists and theorists had during the workshop, from "what would the ideal MRI experiment be like," to "can we understand the nonlinear saturation of the MRI?"
Proceedings - 2003

The Role of MHD Turbulence in Magnetic Self-excitation - Mark D. Nornberg 2006

Chaos - Bertrand Duplantier 2013-11-26
This twelfth volume in the Poincaré Seminar Series presents a complete and interdisciplinary perspective on the concept of Chaos, both in classical mechanics in its deterministic version, and in quantum mechanics. This book expounds some of the most wide ranging questions in science, from uncovering the fingerprints of classical chaotic dynamics in quantum systems, to predicting the fate of our own planetary system. Its seven articles are also highly pedagogical, as befits their origin in lectures to a broad scientific audience. Highlights include a complete description by the mathematician É. Ghys of the paradigmatic Lorenz attractor, and of the famed Lorenz butterfly effect as it is understood today, illuminating the fundamental mathematical issues at play with deterministic chaos; a detailed account by the experimentalist S. Fauve of the masterpiece experiment, the von Kármán Sodium or VKS experiment, which established in 2007 the spontaneous generation of a magnetic field in a strongly turbulent flow, including its reversal, a model of Earth's magnetic field; a simple toy model by the theorist U. Smilansky – the discrete Laplacian on finite d-regular expander graphs – which allows one to grasp the essential ingredients of quantum chaos, including its fundamental link to random matrix theory; a review by the mathematical physicists P. Bourgade and J.P. Keating, which illuminates the fascinating connection between the distribution of zeros of the Riemann ζ-function and the statistics of eigenvalues of random unitary matrices, which could ultimately provide a spectral interpretation for the zeros of the ζ-function, thus a proof of the celebrated Riemann Hypothesis itself; an article by a pioneer of experimental quantum chaos, H-J. Stöckmann, who shows in detail how experiments on the propagation of microwaves in 2D or 3D chaotic cavities beautifully verify theoretical predictions; a thorough presentation by the mathematical physicist S. Nonnenmacher of the "anatomy" of the eigenmodes of quantized chaotic systems, namely of their macroscopic localization properties, as ruled by the Quantum Ergodic theorem, and of the deep mathematical challenge posed by their fluctuations at the microscopic scale; a review, both historical and scientific, by the astronomer J. Laskar on the stability, hence the fate, of the chaotic Solar planetary system we live in, a subject where he made groundbreaking contributions, including the probabilistic estimate of possible planetary collisions. This book should be of broad general interest to both physicists and mathematicians.
Numerical Simulations of Current Generation and Dynamo Excitation in a Mechanically-forced, Turbulent Flow - R. Adam Bernell Bayliss 2006

The British National Bibliography - Arthur James Wells 2001

Treatise on Geophysics: Core dynamics - Gerald Schubert 2007
The Treatise on geophysics is the only comprehensive, state-of-the-art, and integrated summary of the present state of geophysics. Offering an array of articles from some of the top scientists around the world, this 11-volume work deals with all major parts of solid-Earth geophysics, including a volume on the terrestrial planets and moons in our Solar System. This major reference work will aid researchers, advanced undergrad and graduate students, as well as professionals in cutting-edge research.

Peyresq Lectures On Nonlinear Phenomena, Volume Ii - Jacques-alexandre Sepulchre 2003-05-20
This book is the second volume of lecture notes on various topics in nonlinear physics delivered by specialists in the field who gave courses in the small village of Peyresq (France) during summer schools (2000, 2001, 2002) organised by the Institut Non Linéaire de Nice (INLN), in collaboration with the Institut de Recherche de Physique Hors Equilibre (IRPHE). The goal is to provide good summaries on the state of the art of some domains in physics having the common denominator of belonging to nonlinear sciences, and to promote the transfer of knowledge between them.

Mathematical Aspects of Natural Dynamos - Emmanuel Dormy 2007-06-11
Although the origin of Earth's and other celestial bodies' magnetic fields remains unknown, we do know that the motion of electrically conducting fluids generates and maintains these fields, forming the basis of magnetohydrodynamics (MHD) and, to a larger extent, dynamo theory. Answering the need for a comprehensive, interdisciplinary introduction to this area, Mathematical Aspects of Natural Dynamos provides a foundation in dynamo theory before moving on to modeling aspects of natural dynamos. Bringing together eminent international contributors, the book first introduces governing equations, outlines the kinematic dynamo theory, covers nonlinear effects, including amplitude saturation and polarity reversals, and discusses fluid dynamics. After establishing this base, the book describes the Earth's magnetic field and the current understanding of its characteristics. Subsequent chapters examine other planets in our solar system and the magnetic field of stars, including the sun. The book also addresses dynamo action on the large scale of galaxies, presents modeling experiments of natural dynamos, and speculates about future research directions. After reading this well-illustrated, thorough, and unified exploration, you will be well prepared to embark on your own journey through this fascinating area of research.

Physics Letters - 2002
General physics, atomic physics, molecular physics, and solid state physics.

Advances in Astronomy - J. M. T. Thompson 2005
"Derived in part from work originally published in the Philosophical Transactions of the Royal Society, series A (Phil. Trans. R. Soc. A, 360, 2649-3004, 2002)."--t.p.

Dynamos - 2011-07-29
Dynamos is a collection of lectures given in July 2007 at the Les Houches Summer School on "Dynamos". Provides a pedagogical introduction to topics in Dynamos Addresses each topic from the basis to the most recent developments Covers the lectures by internationally-renowned and leading experts

Handbook of Mathematical Fluid Dynamics - S. Friedlander 2002
Cover -- Contents of the Handbook: Volume 1 -- Content -- Preface -- List of Contributors -- Chapter 1. Statistical Hydrodynamics -- Chapter 2. Topics on Hydrodynamics and Volume Preserving Maps -- Chapter 3. Weak Solutions of Incompressible Euler Equations -- Chapter 4. Near Identity Transformations for the Navier-Stokes Equations -- Chapter 5. Planar Navier-Stokes Equations: Vorticity Approach -- Chapter 6. Attractors of Navier-Stokes Equations -- Chapter 7. Stability and Instability in Viscous Fluids -- Chapter 8. Localized Instabilities in Fluids -- Chapter 9. Dynamo Theory -- Chapter 10. Water-Waves as a Spatial Dynamical System -- Chapter 11. Solving the Einstein Equations by Lipschitz Continuous Metrics: Shock Waves in General Relativity -- Author Index -- Subject Index
International Congress Calendar - 2000

Experimental Observation of Flucuation-driven Mean Magnetic Fields in the Madison Dynamo Experiment - Erik J. Spence 2006

mathematical problem papers -

Dynamo and Dynamics, a Mathematical Challenge - Pascal Chossat 2012-12-06
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held in Cargese from August 21 to 26, 2000. The workshop differed from most previous conferences on the dynamo effect in two important respects. First, it was at this international conference that the experimental observation of homogeneous fluid dynamos was first reported. Second, the conference gathered scientists from very different fields, thus showing that thepynamo problem has become an interdisciplinary subject involving not only astrophysicists and geophysicists, but also scientists working in dynamical systems theory, hydrodynamics, and numerical simulation, as well as several groups in experimental physics. This book thus reports important results on various dynamo studies in these different contexts: - Decades after the discovery of the first analytic examples of laminar fluid dynamos, the self-generation of a magnetic field by a flow ofliquid sodium has been reported by the Karlsruhe and Riga groups. Although there were no doubts concerning the self generation by the laminar Roberts-type or Ponomarenko-type flows that were used, these experiments have raised interesting questions about the influence of the turbulent fluctuations on the dynamo threshold and on the saturation level of the magnetic field.

Mathematical Aspects of Natural Dynamos - Emmanuel Dormy 2007-06-11
This unified, interdisciplinary, and comprehensive collection provides a foundation in dynamo theory before moving on to modeling aspects of natural dynamos. It introduces governing equations, outlines the kinematic dynamo theory, covers nonlinear effects, and discusses fluid dynamics. The book then describes the Earth's magnetic field and the current understanding of its characteristics. Subsequent chapters examine other planets in our solar system and the magnetic field of stars, including the sun. The book also addresses dynamo action on the large scale of galaxies, presents modeling experiments of natural dynamos, and speculates about future research directions.

Peyresq Lectures on Nonlinear Phenomena - Jacques-Alexandre Sepulchre 2003
"This book is the second volume of a compilation of lecture notes on various topics in nonlinear physics delivered by specialists during the summer schools organized by the Institut Non Linaeaire de Nice ... in Peyresq ... since 1998. The first volume, edited by R. Kaiser and J. Montaldi, contains courses from the years 1998 and 1999. This volume collects notes of the lectures given from the summers of 2000, 2001 and 2002"--Preface, v. 2.

The Symmetry Perspective - Martin Golubitsky 2012-12-06
The framework of 'symmetry' provides an important route between the abstract theory and experimental observations. The book applies symmetry methods to dynamical systems, focusing on bifurcation and chaos theory. Its exposition is organized around a wide variety of relevant applications. From the reviews: "[The] rich collection of examples makes the book...extremely useful for motivation and for spreading the ideas to a large Community."--MATHEMATICAL REVIEWS
Izvestiya, Russian Academy of Sciences - 2006

Experimental Chaos - Stefano Boccaletti 2002
Most genetics textbooks deal adequately with plant and animal genetics, but tend to neglect fungi except for two areas. Firstly, the ascus segregations which, in the 1960s, contributed so much to developing an understanding of the mechanism of recombination and secondly, the contribution that work on yeast (as a model eukaryote) is currently making to understanding cell cycle control and its genetic regulation. Consequently, most introductory genetics texts will leave the reader/student with the impression that fungi are of use when peculiarities of their structure or life style suit them to particular experimental approaches, but are not worth mentioning otherwise. The authors have produced a book that will compensate for this imbalance. This book discusses the genetics of fungi, or mycology, in a way that is attractive and challenging, succinct yet comprehensive, sensitive to commercial and applied aspects, yet also theoretical, dealing with their genetics from molecules to individuals to population. This short text will be an ideal supplement to the established basic textbooks in genetics or can be used as the sole text for an advanced course devoted to fungal genetics.