S Classical Mechanics By Jc Upadhyay

Several well-established geometric and topological methods are used in this work in an application to a beautiful physical phenomenon known as the geometric phase. This book examines the geometric phase, bringing together different physical phenomena under a unified mathematical scheme. The material is presented so that graduate students and researchers in applied mathematics and physics with an understanding of classical and quantum mechanics can handle the text.

Formalism of classical mechanics underlies a number of powerful mathematical methods that are widely used in theoretical and mathematical physics. This book considers the basics facts of Lagrangian and Hamiltonian mechanics, as well as related topics, such as canonical transformations, integral invariants, potential motion in geometric setting, symmetries, the Noether theorem and systems with constraints. While in some cases the formalism is developed beyond the traditional level adopted in the standard textbooks on classical mechanics, only elementary mathematical methods are used in the exposition of the material. The mathematical constructions involved are explicitly described and explained, so the book can be a good starting point for the undergraduate student new to this field. At the same time and where possible, intuitive motivations are replaced by explicit proofs and direct computations, preserving the level of rigor that makes the book useful for the graduate students intending to work in one of the branches of the vast field of theoretical physics. To illustrate how classical-mechanics formalism works in other branches of theoretical physics, examples related to electrodynamics, as well as to relativistic and quantum mechanics, are included.

By using resources more efficiently, precision agriculture can make farming more productive and sustainable. This collection reviews current research on key technologies in precision agriculture and its applications.

In this Festschrift dedicated to the late Isaiah Shavitt (1925-2012) , selected researchers in theoretical chemistry present research highlights on major developments in the field. Originally published in the journal Theoretical Chemistry Accounts, these outstanding contributions are now available in a hardcover print format, as well as a special electronic edition. This volume provides valuable content for all researchers in theoretical chemistry, and will especially benefit those research groups and libraries with limited access to the journal.

For 30 years, this classic text has been the acknowledged standard in classical mechanics courses. Classical Mechanics enables students to make connections between classical and modern physics â€"" an indispensable part of a physicist's education. The authors have updated the topics, applications, and notations to reflect today's physics curriculum. They introduce students to the increasingly important role that nonlinearities play in contemporary applications of classical mechanics. New numerical exercises help students develop skills in the use of computer techniques to solve problems in phy.

This book discusses fragmentation mechanisms of molecules under mass spectrometry conditions and the resulting peaks observed in ESI-MS/MS experiments. The underlying principles are used to understand everything from small molecules to biological poly-peptides collision induced dissociation. In a theoretical approach, gas phase reactivity of molecular ions is coupled with chemical dynamics simulations.

This self-contained textbook with exercises discusses a broad range of selected topics from classical mechanics and electromagnetic theory that inform key issues related to modern accelerators. Part I presents fundamentals of the Lagrangian and Hamiltonian formalism for mechanical systems, canonical transformations, action-angle variables, and then linear and nonlinear oscillators. The Hamiltonian for a circular accelerator is used to evaluate the equations of motion, the action, and betatron oscillations in an accelerator. From this base, we explore the impact of field errors and nonlinear resonances. This part ends with the concept of the distribution function and an introduction to the kinetic equation to describe large ensembles of charged particles and to supplement the previous single-particle analysis of beam dynamics. Part II focuses on classical electromagnetism and begins with an analysis of the electromagnetic field from relativistic beams, both in vacuum and in a resistive pipe. Plane electromagnetic waves and modes in waveguides and radio-frequency cavities are also discussed. The focus then turns to radiation processes of relativistic beams in different conditions, including transition, diffraction, synchrotron, and undulator radiation. Fundamental concepts such as the retarded time for the observed field from a charged particle, coherent and incoherent radiation, and the formation length of radiation are introduced. We conclude with a discussion of laser-driven acceleration of charged particles and the radiation damping effect. Appendices on electromagnetism and special relativity are included, and references are given in some chapters as a launching point for further reading. This text is intended for graduate students who are beginning to explore the field of accelerator physics, but is also recommended for those who are familiar with particle accelerators but wish to delve further into the theory underlying some of the more pressing concerns in their design and operation.

This comprehensive collection of lectures by leading experts in the field introduces and reviews all relevant computer simulation methods and their applications in condensed matter systems. Volume 1 is an in-depth introduction to a vast spectrum of computational techniques for statistical mechanical systems of condensed matter. Volume 2 is a collection of state-of-the-art surveys on numerical experiments carried out for a great number of systems.

This two-volume text is for new graduates on astronomy courses who need to get to grips with the physics involved in the subject. Four problem sets, averaging three problems per set, accompany each volume. The problems expand on the material covered in the texts and represent the level of calculational skill needed to write scientific papers in contemporary astrophysics.

As a limit theory of quantum mechanics, classical dynamics comprises a large variety of phenomena, from computable (integrable) to chaotic (mixing) behavior. This book presents the KAM (Kolmogorov-Arnold-Moser) theory and asymptotic completeness in classical scattering. Including a wealth of fascinating examples in physics, it offers not only an excellent selection of basic topics, but also an introduction to a number of current areas of research in the field of classical mechanics. Thanks to the didactic structure and concise appendices, the presentation is self-contained and requires only knowledge of the basic courses in mathematics. The book addresses the needs of graduate and senior undergraduate students in mathematics and physics, and of researchers interested in approaching classical mechanics from a modern point of view.

The book provides a collection of recent theoretical and methodological advances which can provide support and stimulus to scientists and scholars involved in research activity in the fields of interest.

Newtonian mechanics : dynamics of a point mass (1001-1108) - Dynamics of a system of point masses (1109-1144) - Dynamics of rigid bodies (1145-1223) - Dynamics of deformable bodies (1224-1272) - Analytical mechanics : Lagrange's equations (2001-2027) - Small oscillations (2028-2067) - Hamilton's canonical equations (2068-2084) - Special relativity (3001-3054).

Over a period of fifty years, the quantum-classical or semi-classical theories have been among the most popular for calculations of rates and cross sections for many dynamical processes: energy transfer, chemical reactions, photodissociation, surface dynamics, reactions in clusters and solutions, etc. These processes are important in the simulation of kinetics of processes in plasma chemistry, chemical reactors, chemical or gas lasers, atmospheric and interstellar chemistry, as well as various industrial processes. This book gives an overview of quantum-classical methods that are currently used for a theoretical description of these molecular processes. It gives the theoretical background for the derivation of the theories from first principles. Enough details are provided to allow numerical implementation of the methods. The book gives the necessary background for understanding the approximations behind the methods and the working schemes for treating energy transfer processes from diatomic to polyatomic molecules, reactions at surfaces, non-adiabatic processes, and chemical reactions.

A groundbreaking text and reference book on twenty-first-century classical physics and its applications This first-year graduate-level text and reference book covers the fundamental concepts and twenty-first-century applications of six major areas of classical physics that every masters- or PhD-level physicist should be exposed to, but often isn't: statistical physics, optics (waves of all sorts), elastodynamics, fluid mechanics, plasma physics, and special and general relativity and cosmology. Growing out of a full-year course that the eminent researchers Kip Thorne and Roger Blandford taught at Caltech for almost three decades, this book is designed to broaden the training of physicists. Its six main topical sections are also designed so they can be used in separate courses, and the book provides an invaluable reference for researchers. Presents all the major fields of classical physics except three prerequisites: classical mechanics, electromagnetism, and elementary thermodynamics Elucidates the interconnections between diverse fields and explains their shared concepts and tools Focuses on fundamental concepts and modern, real-world applications Takes applications from fundamental, experimental, and applied physics; astrophysics and cosmology; geophysics, oceanography, and meteorology; biophysics and chemical physics; engineering and optical science and technology; and information science and technology Emphasizes the quantum roots of classical physics and how to use quantum techniques to elucidate classical concepts or simplify classical calculations Features hundreds of color figures, some five hundred exercises, extensive cross-references, and a detailed index An online illustration package is available

Dedicated to the late Juan Carlos Simo, this volume contains the proceedings of a workshop held at the Fields Institute in October 1993. The articles focus on current algorithms for the integration of mechanical systems, from systems in celestial mechanics to coupled rigid bodies to fluid mechanics. The scope of the articles ranges from symplectic integration methods to energy-momentum methods and related themes.

A development of the basic theory and applications of mechanics with an emphasis on the role of symmetry. The book includes numerous specific applications, making it beneficial to physicists and engineers. Specific examples and applications show how the theory works, backed by up-to-date techniques, all of which make the text accessible to a wide variety of readers, especially senior undergraduates and graduates in mathematics, physics and engineering. This second edition has been rewritten and updated for clarity throughout, with a major revamping and expansion of the exercises. Internet supplements containing additional material are also available.

This textbook covers all the standard introductory topics in classical mechanics, including Newton's laws, oscillations, energy, momentum, angular momentum, planetary motion, and special relativity. It also explores more advanced topics, such as normal modes, the Lagrangian method, gyroscopic motion, fictitious forces, 4-vectors, and general relativity. It contains more than 250 problems with detailed solutions so students can easily check their understanding of the topic. There are also over 350 unworked exercises which are ideal for homework assignments. Password protected solutions are available to instructors at www.cambridge.org/9780521876223. The vast number of problems alone makes it an ideal supplementary text for all levels of undergraduate physics courses in classical mechanics. Remarks are scattered throughout the text, discussing issues that are often glossed over in other textbooks, and it is thoroughly illustrated with more than 600 figures to help demonstrate key concepts.

Over the past decade, great strides have been taken in developing methodologies that can treat more and more complex nano- and nano-bio systems embedded in complex environments. Multiscale Dynamics Simulations covers methods including DFT/MM-MD, DFTB and semi-empirical QM/MM-MD, DFT/MMPOL as well as Machine-learning approaches to all of the above. Focusing on key methodological breakthroughs in the field, this book provides newcomers with a comprehensive menu of multiscale modelling options so that they can better chart their course in the nano/bio world.

This textbook teaches classical mechanics as one of the foundations of physics. It describes the mechanical stability and motion in physical systems ranging from the molecular to the galactic scale. Aside from the standard topics of mechanics in the physics curriculum, this book includes an introduction to the theory of elasticity and its use in selected modern engineering applications, e.g. dynamic mechanical analysis of viscoelastic materials. The text also covers many aspects of numerical mechanics, ranging from the solution of ordinary differential equations, including molecular dynamics simulation of many particle systems, to the finite element method. Attendant Mathematica programs or parts thereof are provided in conjunction with selected examples. Numerous links allow the reader to connect to related subjects and research topics. Among others this includes statistical mechanics (separate chapter), quantum mechanics, space flight, galactic dynamics, friction, and vibration spectroscopy. An introductory chapter compiles all essential mathematical tools, ranging from coordinates to complex numbers. Completely solved problems and examples facilitate a thorough understanding of the material.

A groundbreaking textbook on twenty-first-century statistical physics and its applications Kip Thorne and Roger Blandford's monumental Modern Classical Physics is now available in five stand-alone volumes that make ideal textbooks for individual graduate or advanced undergraduate courses on statistical physics; optics; elasticity and fluid dynamics; plasma physics; and relativity and cosmology. Each volume teaches the fundamental concepts, emphasizes modern, real-world applications, and gives students a physical and intuitive understanding of the subject. Statistical Physics is an essential introduction that is different from others on the subject because of its unique approach, which is coordinate-independent and geometric; embraces and elucidates the close quantum–classical connection and the relativistic and Newtonian domains; and demonstrates the power of statistical techniques—particularly statistical mechanics—by presenting applications not only to the usual kinds of things, such as gases, liquids, solids, and magnetic materials, but also to a much wider range of phenomena, including black holes, the universe, information and communication, and signal processing amid noise. Includes many exercise problems Features color figures, suggestions for further reading, extensive cross-references, and a detailed index Optional “Track 2” sections make this an ideal book for a one-quarter, half-semester, or full-semester course An online illustration package is available to professors

Applications not usually taught in physics courses include theory of space-charge limited currents, atmospheric drag, motion of meteoritic dust, variational principles in rocket motion, transfer functions, much more. 1960 edition.

Mechanics as a fundamental science in Physics and in Engineering deals with interactions of forces resulting in motion and deformation of material bodies. Similar to other sciences Mechanics serves in the world of Physics and in that of Engineering in a di?erent way, in spite of many and increasing inter- pendencies. Machines and mechanisms are for physicists tools for cognition and research, for engineers they are the objectives of research, according to a famous statement of the Frankfurt physicist and biologist Friedrich Dessauer. Physicists apply machines to support their questions to Nature with the goal of new insights into our physical world. Engineers apply physical knowledge to support the realization process of their ideas and their intuition. Physics is an analytical Science searching for answers to questions concerning the world around us. Engineering is a synthetic Science, where the physical and ma- ematical fundamentals play the role of a kind of reinsurance with respect to a really functioning and e?ciently operating machine. Engineering is also an iterative Science resulting in typical long-time evolutions of their products, but also in terms of the relatively short-time developments of improving an existing product or in developing a new one. Every physical or mathematical Science has to face these properties by developing on their side new methods, new practice-proved algorithms up to new fundamentals adaptable to new technological developments. This is as a matter of fact also true for the ?eld of Mechanics.

Major superconducting properties including zero resistance, Meissner effect, sharp phase change, flux quantization, excitation energy gap, Josephson effects are covered and microscopically explained, using quantum statistical mechanical calculations. First treated are the 2D superconductivity and then the quantum Hall effects. Included are exercise-type problems for each section. Readers can grasp the concepts covered in the book by following the worked-through problems. Bibliographies are included in each chapter and a glossary and list of symbols are given in the beginning of the book. The book is based on the materials taught by S. Fujita for several courses in Quantum Theory of Solids, Advanced Topics in Modern Physics, and Quantum Statistical Mechanics.

Trajectory-based formalisms are an intuitively appealing way of describing quantum processes because they allow the use of "classical" concepts. Beginning as an introductory level suitable for students, this two-volume monograph presents (1) the fundamentals and (2) the applications of the trajectory description of basic quantum processes. This second volume is focussed on simple and basic applications of quantum processes such as interference and diffraction of wave packets, tunneling, diffusion and bound-state and scattering problems. The corresponding analysis is carried out within the Bohmian framework. By stressing its interpretational aspects, the book leads the reader to an alternative and complementary way to better understand the underlying quantum dynamics.

This accessible monograph introduces physicists to the general relation between classical and quantum mechanics based on the mathematical idea of deformation quantization and describes an original approach to the theory of quantum integrable systems developed by the author.The first goal of the book is to develop of a common, coordinate free formulation of classical and quantum Hamiltonian mechanics, framed in common mathematical language.In particular, a coordinate free model of quantum Hamiltonian systems in Riemannian spaces is formulated, based on the mathematical idea of deformation quantization, as a complete physical theory with an appropriate mathematical accuracy.The second goal is to develop of a theory which allows for a deeper understanding of classical and quantum integrability. For this reason the modern separability theory on both classical and quantum level is presented. In particular, the book presents a modern geometric separability theory, based on bi-Poissonian and bi-presymplectic representations of finite dimensional Liouville integrable systems and their admissible separable quantizations.The book contains also a generalized theory of classical Stäckel transforms and the discussion of the concept of quantum trajectories.In order to make the text consistent and self-contained, the book starts with a compact overview of mathematical tools necessary for understanding the remaining part of the book. However, because the book is dedicated mainly to physicists, despite its mathematical nature, it refrains from highlighting definitions, theorems or lemmas.Nevertheless, all statements presented are either proved or the reader is referred to the literature where the proof is available.

Over the past few decades, several approaches have been developed for designing nano-structured or molecularly-structured materials. These advances have revolutionized practically all fields of science and engineering, providing an additional design variable, the feature size of the nano-structures, which can be tailored to provide new materials with very special characteristics. Nanomaterials: Design and Simulation explores the role that such advances have made toward a rational design of nanostructures and covers a variety of methods from ab initio electronic structure techniques, ab initio molecular dynamics, to classical molecular dynamics, also being complemented by coarse-graining and continuum methods. Also included is an overview of how the development of these computational tools has enabled the possibility of exploring nanoscopic details and using such information for the prediction of physical and chemical properties that are not always possible to be obtained experimentally. * Provides an overview of approaches that have been developed for designing nano-structured or molecularly-structured materials. * This volume covers several aspects of the simulation and design of nanomaterials analyzed by a selected group of active researchers in the field. * Looks at how the advancement of computational tools have enabled nanoscopic prediction of physical and chemical properties

This volume highlights recent developments of stochastic analysis with a wide spectrum of applications, including stochastic differential equations, stochastic geometry, and nonlinear partial differential equations. While modern stochastic analysis may appear to be an abstract mixture of classical analysis and probability theory, this book shows that, in fact, it can provide versatile tools useful in many areas of applied mathematics where the phenomena being described are random. The geometrical aspects of stochastic analysis, often regarded as the most promising for applications, are specially investigated by various contributors to the volume.

The new edition includes additional analytical methods in the classical theory of viscoelasticity. This leads to a new theory of finite linear viscoelasticity of incompressible isotropic materials. Anisotropic viscoplasticity is completely reformulated and extended to a general constitutive theory that covers crystal plasticity as a special case.

This textbook takes a broad yet thorough approach to mechanics, aimed at bridging the gap between classical analytic and modern differential geometric approaches to the subject. Developed by the authors from over 30 years of teaching experience, the presentation is designed to give students an overview of the many different models used through the history of the field—from Newton to Hamilton—while also painting a clear picture of the most modern developments. The text is organized into two parts. The first focuses on developing the mathematical framework of linear algebra and differential geometry necessary for the remainder of the book. Topics covered include tensor algebra, Euclidean and symplectic vector spaces, differential manifolds, and absolute differential calculus. The second part of the book applies these topics to kinematics, rigid body dynamics, Lagrangian and Hamiltonian dynamics, Hamilton–Jacobi theory, completely integrable systems, statistical mechanics of equilibrium, and impulsive dynamics, among others. This new edition has been completely revised and updated and now includes almost 200 exercises, as well as new chapters on celestial mechanics, one-dimensional continuous systems, and variational calculus with applications. Several Mathematica® notebooks are available to download that will further aid students in their understanding of some of the more difficult material. Unique in its scope of coverage and method of approach, Classical Mechanics with Mathematica® will be useful resource for graduate students and advanced undergraduates in applied mathematics and physics who hope to gain a deeper understanding of mechanics.

Intended for advanced undergraduates and beginning graduate students, this text is based on the highly successful course given by Walter Greiner at the University of Frankfurt, Germany. The two volumes on classical mechanics provide not only a complete survey of the topic but also an enormous number of worked examples and problems to show students clearly how to apply the abstract principles to realistic problems.

There is no sharp dividing line between the foundations of physics and philosophy of physics. This is especially true for quantum mechanics. The debate on the interpretation of quantum mechanics has raged in both the scientific and philosophical communities since the 1920s and continues to this day. (We shall understand the unqualified term ‘quantum mechanics’ to mean the mathematical formalism, i. e. laws and rules by which empirical predictions and theoretical advances are made.) There is a popular rendering of quantum mechanics which has been publicly endorsed by some well known physicists which says that quantum mechanics is not only 1 more weird than we imagine but is weirder than we can imagine. Although it is readily granted that quantum mechanics has produced some strange and counter-intuitive results, the case will be presented in this book that quantum mechanics is not as weird as we might have been led to believe! The prevailing theory of quantum mechanics is called Orthodox Quantum Theory (also known as the Copenhagen Interpretation). Orthodox Quantum Theory endows a special status on measurement processes by requiring an intervention of an observer or an observer’s proxy (e. g. a measuring apparatus). The placement of the observer (or proxy) is somewhat arbitrary which introduces a degree of subjectivity. Orthodox Quantum Theory only predicts probabilities for measured values of physical quantities. It is essentially an instrumental theory, i. e.

This is a rapidly developing field to which the author is a leading contributor New methods in quantum dynamics and computational techniques, with applications to interesting physical problems, are brought together in this book Useful to both students and researchers

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The role of quantum coherence in promoting the e ciency of the initial stages of photosynthesis is an open and intriguing question. Lee, Cheng, and Fleming, Science 316, 1462 (2007) The understanding and design of functional biomaterials is one of today’s grand challenge areas that has sparked an intense exchange between biology, materials sciences, electronics, and various other disciplines. Many new - velopments are underway in organic photovoltaics, molecular electronics, and biomimetic research involving, e. g. , arti cal light-harvesting systems inspired by photosynthesis, along with a host of other concepts and device applications. In fact, materials scientists may well be advised to take advantage of Nature’s 3. 8 billion year head-start in designing new materials for light-harvesting and electro-optical applications. Since many of these developments reach into the molecular domain, the - derstanding of nano-structured functional materials equally necessitates f- damental aspects of molecular physics, chemistry, and biology. The elementary energy and charge transfer processes bear much similarity to the molecular phenomena that have been revealed in unprecedented detail by ultrafast op- cal spectroscopies. Indeed, these spectroscopies, which were initially developed and applied for the study of small molecular species, have already evolved into an invaluable tool to monitor ultrafast dynamics in complex biological and materials systems. The molecular-level phenomena in question are often of intrinsically quantum mechanical character, and involve tunneling, non-Born- Oppenheimer e ects, and quantum-mechanical phase coherence.

Since 1975, the Marcel Grossmann Meetings have been organized to provide opportunities for discussing recent advances in gravitation, general relativity and relativistic field theories, emphasizing mathematical foundations, physical predictions and experimental tests. The objective of these meetings is to facilitate exchange among scientists that may deepen our understanding of space-time structures and to review the status of ongoing experiments aimed at testing Einstein's theory of gravitation from either the ground or space.The Eighth Marcel Grossmann Meeting took place on 22-27 June, 1997, at the Hebrew University of Jerusalem, Israel. The scientific program included 25 plenary talks and 40 parallel sessions during which 400 papers were presented. The papers that appear in this book cover all aspects of gravitation, from mathematical issues to recent observations and experiments.

This book provides a concise description of the current status of a fascinating scientific problem — the inverse variational problem in classical mechanics. The essence of this problem is as follows: one is given a set of equations of motion describing a certain classical mechanical system, and the question to be answered is: Do these equations of motion correspond to some Lagrange function as its Euler–Lagrange equations? In general, not for every system of equations of motion does a Lagrange function exist; it can, however, happen that one may modify the given equations of motion in such a way that they yield the same set of solutions as the original ones and they correspond already to a Lagrange function. Moreover, there can even be infinitely many such Lagrange functions, the relations among which are not trivial. The book deals with this scope of problems. No advanced mathematical methods, such as, contemporary differential geometry, are used. The intention is to meet the standard educational level of a broad group of physicists and mathematicians. The book is well suited for use as lecture notes in a university course for physicists. Contents:Constants of MotionTheorem of HenneauxInstructive Example of DouglasConstruction of the Most General Autonomous One-Particle Lagrange Function in (3+1) Space–Time Dimensions Giving Rise to Rotationally Covariant Euler–Lagrange EquationsEvaluation of the Function GijConstruction of the Most General Two-Particle Lagrange Function in (1+1) Space–Time Dimensions Giving Rise to Euler–Lagrange Equations Covariant Under Galilei TransformationGalilei Forminvariance of the Euler–Lagrange Equations for Two Particles in (1+1) Space–Time Dimensions Readership: Graduate students of theoretical physics and mathematics, as well as theoretical physicists doing research in classical and quantum mechanics. Keywords:Variational Calculus;Classical Mechanics;Lagrange Function;Galilei Group;Euler-Lagrange;Constants of Motion;Linear Partial Differential Equations;Inverse Variational Problem;Poincare Lemma;Helmholtz Conditions;Theorem of Henneaux;Hamilton Formalism;S-Equivalence of Lagrange Functions;Weakly Symmetrical Lagrange Functions;Douglas' Method;Poisson Bracket;Lagrange Bracket

This book provides a penetrating and comprehensive description of energy selected reactions from a theoretical as well as experimental view. Three major aspects of unimolecular reactions involving the preparation of the reactants in selected energy states, the rate of dissociation of the activated molecule, and the partitioning of the excess energy among the final products, are fully discussed with the aid of 175 illustrations and over 1,000 references, most from the recent literature. Examples of both neutral and ionic reactions are presented. Many of the difficult topics are discussed at several levels of sophistication to allow access by novices as well as experts. Among the topics covered for the first time in monograph form is a discussion of highly excited vibrational/rotational states and intramolecular vibrational energy redistribution. Problems associated with the application of RRKM theory are discussed with the aid of experimental examples. Detailed comparisons are also made between different statistical models of unimolecular decomposition. Both quantum and classical models not based on statistical assumptions are described. Finally, a chapter devoted to the theory of product energy distribution includes the application of phase space theory to the dissociation of small and large clusters. The work will be welcomed as a valuable resource by practicing researchers and graduate students in physical chemistry, and those involved in the study of chemical reaction dynamics.

TV artist and teacher Hazel Soan is well known for her watercolours of Africa. This illustrated guide is both a safari through her beloved southern Africa and an instructional journey through a range of subjects, showing different ways to see and paint them. Aimed at the more practised painter, this is an useful book for the reader looking to add adventure to their painting. Focusing on the popular medium of watercolour, Hazel travels through South Africa, Namibia, Botswana and Zimbabwe, getting to know her destinations by painting them. As the journey unfolds, she presents a series of painting projects.