

## Chapter 3 2 Energy Flow

Tropical habitats cover over one third of the Earth's terrestrial surface and harbor much of its biodiversity, with many areas rich in endemic species. However, these ecosystems are under significant and growing threat from issues such as deforestation, land degradation and ocean acidification. This introductory textbook provides a comprehensive guide to the major tropical biomes. It is unique in its balanced coverage of both aquatic and terrestrial systems and in its international scope. Each chapter is built around a particular tropical ecosystem, with descriptive case studies providing a framework around which ecological concepts and applied ecological topics are presented. This second edition has been thoroughly updated to reflect recent advances in the field and includes a greater focus on the impact of global climate change. The text is supported throughout by boxes containing supplementary material and is illustrated with over 200 clear, simple line diagrams, maps and photographs.

The perfect answer for any instructor seeking a more concise, meaningful, and flexible alternative to the standard introductory biology text.

Introduction to Molecular Energy Transfer intends to provide an elementary introduction to the subject of molecular energy transfer and relaxation. The book covers the foundation of molecular energy transfer such as quantum mechanics; the vibrational state of molecules; and vibrational energy transfer and the experimental methods for its study. Coverage also includes the different kinds of energy transfer in gases; vibrational relaxation in condensed phases; electronic states and interactions; electronic energy as a result of intermolecular interaction; radiationless electronic transition; and rotational energy transfer. The text is recommended for students, graduates, and researchers in the fields of physics and chemistry, especially those who would like to know more about molecular energy transfer.

This text explores the field of microscale heat transfer in mechanical engineering. Experts from a wide range of science and engineering disciplines present topics that are built from simple macroscopic concepts and gradually lead into microscopic concepts. The book begins with an introductory chapter which discusses the history and the future directions of microscale heat transfer. It is then divided into two sections: the Fundamentals and the Applications.

From the life experiences of a career teacher with a spiritual bent comes a how to book making the case for living a balanced life. Maintaining this balance is achieved through a conscious effort to keep your energy flowing freely. Your energy can be blocked in many ways, and it is important to identify the sources of blocked energy and to restore your balance. With restored balance comes a healthier, happier, and more harmonious life. An energy imbalance caused from blocked energy leads to dis-ease. If this happens over a long period of time, it becomes a destructive force. This can lead to mental and physical problems. Releasing blocked energy allows a free flow of energy. By unblocking your energy flow, you will have enhanced creativity, better relationships, a positive energized outlook, and a healthier life. This book describes how to raise your awareness and how to take steps to identify and release your blocked energy.

Compact Heat Exchangers for Energy Transfer Intensification: Low-Grade Heat and Fouling Mitigation provides theoretical and experimental background on heat transfer intensification in modern heat exchangers. Emphasizing applications in complex heat recovery systems for the process industries, this book:Covers various issues related to low-grade hea

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

Inspiring people to care about the planet. In the new edition of LIVING IN THE ENVIRONMENT, authors Tyler Miller and Scott Spoolman have partnered with the National Geographic Society to develop a text designed to equip students with the inspiration and knowledge they need to make a difference solving today's environmental issues. Exclusive content highlights important work of National Geographic Explorers, and features over 200 new photos, maps, and illustrations that bring course concepts to life. Using sustainability as the integrating theme, LIVING IN THE ENVIRONMENT 18e, provides clear introductions to the multiple environmental problems that we face and balanced discussions to evaluate potential solutions. In addition to the integration of new and engaging National Geographic content, every chapter has been thoroughly updated and 18 new Core Case Studies offer current examples of present environmental problems and scenarios for potential solutions. The concept-centered approach used in the text transforms complex environmental topics and issues into key concepts that students will understand and remember. Overall, by framing the concepts with goals for more sustainable lifestyles and human communities, students see how promising the future can be and their important role in shaping it. offers additional exclusive National Geographic content, including high-quality videos on important environmental problems and efforts being made to address them. Team up with Miller/Spoolman's, LIVING IN THE ENVIRONMENT and the National Geographic Society to offer your students the most inspiring introduction to environmental science

available! Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

In a wide-ranging metaphysical discussion from consciousness, incarnation and death to politics, economics and science, the author describes a cooperative universe which responds to an individual's thoughts, and provides a user-friendly interface.

Introduction to Non-equilibrium Physical Chemistry presents a critical and comprehensive account of Non-equilibrium Physical Chemistry from theoretical and experimental angle. It covers a wide spectrum of non-equilibrium phenomena from steady state close to equilibrium to non-linear region involving transition to bistability, temporal oscillations, spatio-temporal oscillations and finally to far from equilibrium phenomena such as complex pattern formation, dynamic instability at interfaces, Chaos and complex growth phenomena (fractals) in Physico-chemical systems. Part I of the book deals with theory and experimental studies concerning transport phenomena in membranes (Thermo-osmosis, Electroosmotic) and in continuous systems (Thermal diffusion, Soret effect) close to equilibrium. Experimental tests provide insight into the domain of validity of Non-equilibrium Thermodynamics, which is the major theoretical tool for this region. Later developments in Extended Irreversible Thermodynamics and Non-equilibrium Molecular dynamics have been discussed in the Appendix. Part II deals with non-linear steady states and bifurcation to multistability, temporal and spatio-temporal oscillations (Chemical waves). Similarly Part III deals with more complex phenomena such as Chaos and fractal growth occurring in very far from equilibrium region. Newer mathematical techniques for investigating such phenomena along with available experimental studies. Part IV deals with analogous non-equilibrium phenomena occurring in the real systems (Socio-political, Finance and Living systems etc.) for which physico-chemical systems discussed in earlier chapters provide a useful model for development of theories based on non-linear science and science of complexity. The book provides a critical account of theoretical studies on non-equilibrium phenomenon from region close to equilibrium to far from equilibrium. Experimental studies have been reported which provide test of the theories and their limitations. Impacts of the concepts developed in non-equilibrium Physical Chemistry in sociology, economics and other social science and living systems has been discussed.

This 3rd edition has been expanded and updated to account for recent developments, while new illustrative examples as well as an enlarged reference list have also been added. It naturally retains the successful concept of its predecessors in presenting a unified perspective on molecular charge and energy transfer processes, thus bridging the regimes of coherent and dissipative dynamics, and establishing a connection between classic rate theories and modern treatments of ultrafast phenomena. Among the new topics are: - Time-dependent density functional theory - Heterogeneous electron transfer, e.g. between molecules and metal or semiconductor surfaces - Current flows through a single molecule. While serving as an introduction for graduate students and researchers, this is equally must-have reading for theoreticians and experimentalists, as well as an aid to interpreting experimental data and accessing the original literature. Provides a systematic overview of a hot research area, examining the principles and theories of energy harvesting communications. This book provides a detailed and advanced level introduction to the fundamentals of energy harvesting techniques and their use in state-of-the-art communications systems. It fills the gap in the market by covering both basic techniques in energy harvesting and advanced topics in wireless communications. More importantly, it discusses the application of energy harvesting in communications systems to give readers at different levels a full understanding of these most recent advances in communications technologies. The first half of Energy Harvesting Communications: Principles and Theories focuses on the challenges brought by energy harvesting in communications. The second part of the book looks at different communications applications enhanced by energy harvesting. It offers in-depth chapters that: discuss different energy sources harvested for communications; examine the energy harvesters used for widely used sources; study the physical layer and upper layer of the energy harvesting communications device; and investigate wireless powered communications, energy harvesting cognitive radios, and energy harvesting relaying as applications. Methodically examines the state-of-the-art of energy harvesting techniques. Provides comprehensive coverage from basic energy harvesting sources and devices to the end users of these sources and devices. Looks at the fundamental principles of energy harvesting communications, and biomedical application and intra-body communications. Written in a linear order so that beginners can learn the subject and experienced users can attain a broader view. Written by a renowned expert in the field, Energy Harvesting Communications: Principles and Theories is an excellent resource for students, researchers, and others interested in the subject.

This book describes advances in both experimental and theoretical treatments in the field of energy transfer processes that are relevant to various fields, such as spectroscopy, laser technology, phosphors, artificial solar energy conversion, and photobiology. It presents the principles and available techniques through specific examples. In addition, it examines current and possible applications, including the most recent developments, and projects future advances and research possibilities in the field.

Applying a unified quantum approach, contributors offer fresh insights into the theoretical developments in the excitation energy transfer processes in condensed matter. This comprehensive volume examines Frenkel and Wannier excitonic processes; rates of excitonic processes; theory of laser sputter and polymer ablation; and polarons, excitonic polarons and self-trapping.

Ecosystems introduces the basic concepts and processes in the ecosystem and explores its role in solving environmental problems. Examining the development of the ecosystem concept, the book explains how ecosystems function and analyzes the complex interactions between life and its physical environment. Presenting examples from all parts of the world within lively case studies and illustrations, Ecosystems focuses on 'real world' problems and topical and controversial issues, particularly on human impacts on the natural environment, and the consequences of environmental change.

Although the fundamental concepts of Maxwell remain for the most part unchanged since their inception, electromagnetic theory has continued to evolve, extending, most significantly, to shorter and shorter wavelengths. This has revealed many of nature's mysteries. And led to a myriad of applications that have literally changed our world. The second edition of Electromagnetic Theory and Wave Propagation begins by presenting the basic concepts of electromagnetic theory, then explores the field's extended areas primarily discovered after World War II. The author elaborates on the work of pioneer investigators, particularly with respect to the identity of light and electromagnetic waves and then derives the fundamental laws of optics from electromagnetic considerations. He has also added several new topics including meteor astronomy, remote sensing and, most notably, discussions on relativistic electrodynamics.

This conference was the third meeting organized in the framework of the European LOcNET project. The main topics discussed by this international research collaboration were localization by

nonlinearity and spatial discreteness, and energy transfer (in crystals, biomolecules and Josephson arrays). Contents: The Discrete Nonlinear Schrödinger Equation — 20 Years on (J C Eilbeck & M Johansson) Breathers and Conformational Transitions in Molecular Crystals (M Barthes) Some Exact Results for Quantum Lattice Problems (J C Eilbeck) Isochronous Potentials (S Bolotin & R S Mackay) Dynamics of Discrete Breathers in Flexible Chains (J M Sancho et al.) Interaction of Moving Breathers with an Impurity (J Cuevas et al.) Quantum Targeted Energy Transfer (P Maniadis et al.) Spontaneous Pattern Retrieval in a Neural Network (M-P Zorzano) Discrete Breathers in 2D Josephson Arrays (J J Mazo) Fluxon Ratchet Potentials (J J Mazo et al.) and other papers Readership: Researchers, academics and graduate students in the fields of new materials, analysis & differential equations, numerical & computational mathematics, stochastic theory, theoretical physics, statistical physics, semiconductors and mathematical biology. Keywords: Nonlinearity; Spatial Discreteness; Energy Transfer; Crystals; Biomolecules; Josephson Array; Localization

A deep dive into wireless energy transfer technologies for IoT networks In *Wireless Energy Transfer: Towards Sustainable Zero-Energy IoT Networks*, distinguished researchers Onel L. A. López and Hirley Alves deliver a robust discussion of massive wireless energy transfer and zero-energy, low-cost, Internet of Things networks. Moving beyond the basic theoretical background of the subject, the authors offer a deep analysis of the scenarios and requirements of wireless energy transfer. The book details novel powering schemes recently proposed to face the challenging requirements of the future Internet of Things, as well as a comprehensive review of sustainable IoT wireless networks. *Wireless Energy Transfer* explains why novel energy efficient solutions will be needed to address the sheer volume of devices currently forecasted to be used in the near future. It explores the challenges technologists and users will face as well as proposed solutions and future research directions. The authors also discuss: Thorough introductions to wireless energy transfer, including energy harvesting sources, radio frequency energy harvesting circuits, efficiency models, and architectures for wireless energy transfer powered IoT networks Comprehensive explorations of ambient radio frequency energy harvesting, including measurement campaigns, energy harvesting hardware prototypes, and performance analysis based on stochastic geometry Practical discussions of efficient schemes for massive wireless energy transfer, including energy beamforming, multi-antenna techniques, and distributed antenna systems Perfect for students and researchers in signal processing, communications, networking, and information theory, *Wireless Energy Transfer: Towards Sustainable Zero-Energy IoT Networks* will also earn a place in the libraries of students and practitioners in the fields of communication hardware and transceiver design.

This three-volume book gives a thorough and comprehensive presentation of vibration and acoustic theories. Different from traditional textbooks which typically deal with some aspects of either acoustic or vibration problems, it is unique of this book to combine those two correlated subjects together. Moreover, it provides fundamental analysis and mathematical descriptions for several crucial phenomena of Vibro-Acoustics which are quite useful in noise reduction, including how structures are excited, energy flows from an excitation point to a sound radiating surface, and finally how a structure radiates noise to a surrounding fluid. Many measurement results included in the text make the reading interesting and informative. Problems/questions are listed at the end of each chapter and the solutions are provided. This will help the readers to understand the topics of Vibro-Acoustics more deeply. The book should be of interest to anyone interested in sound and vibration, vehicle acoustics, ship acoustics and interior aircraft noise. This is the third volume, and presents 201 problems and their solutions plus a summary of the main results from volumes 1 and 2.

Textbook provides complete coverage of the CAPE Biology Unit 2 syllabus. There are worked examples, a glossary of important biological terms, end of chapter questions in a range of formats (multiple choice, structured and essay questions) and a summary of key ideas at the end of the chapter

An introduction to risk assessment that utilizes key theory and state-of-the-art applications With its balanced coverage of theory and applications along with standards and regulations, *Risk Assessment: Theory, Methods, and Applications* serves as a comprehensive introduction to the topic. The book serves as a practical guide to current risk analysis and risk assessment, emphasizing the possibility of sudden, major accidents across various areas of practice from machinery and manufacturing processes to nuclear power plants and transportation systems. The author applies a uniform framework to the discussion of each method, setting forth clear objectives and descriptions, while also shedding light on applications, essential resources, and advantages and disadvantages. Following an introduction that provides an overview of risk assessment, the book is organized into two sections that outline key theory, methods, and applications. *Introduction to Risk Assessment* defines key concepts and details the steps of a thorough risk assessment along with the necessary quantitative risk measures. Chapters outline the overall risk assessment process, and a discussion of accident models and accident causation offers readers new insights into how and why accidents occur to help them make better assessments. *Risk Assessment Methods and Applications* carefully describes the most relevant methods for risk assessment, including preliminary hazard analysis, HAZOP, fault tree analysis, and event tree analysis. Here, each method is accompanied by a self-contained description as well as workflow diagrams and worksheets that illustrate the use of discussed techniques. Important problem areas in risk assessment, such as barriers and barrier analysis, human errors, and human reliability, are discussed along with uncertainty and sensitivity analysis. Each chapter concludes with a listing of resources for further study of the topic, and detailed appendices outline main results from probability and statistics, related formulas, and a listing of key terms used in risk assessment. A related website features problems that allow readers to test their comprehension of the presented material and supplemental slides to facilitate the learning process. *Risk Assessment* is an excellent book for courses on risk analysis and risk assessment at the upper-undergraduate and graduate levels. It also serves as a valuable reference for engineers, researchers, consultants, and practitioners who use risk assessment techniques in their everyday work.

The field of environmental chemistry has evolved significantly since the publication of the first edition of *Environmental Chemistry*. Throughout the book's long life, it has chronicled emerging issues such as organochloride pesticides, detergent phosphates, stratospheric ozone depletion, the banning of chlorofluorocarbons, and greenhouse warming. During this time the first Nobel Prize for environmental chemistry was awarded. Written by environmental chemist Stanley Manahan, each edition has reflected the field's shift of emphasis from pollution and its effects to its current emphasis on sustainability. What makes this book so enduring? Completely revised, this ninth edition retains the organizational structure that has made past editions so popular with students and professors while updating coverage of principles, tools, and techniques to provide fundamental understanding of environmental chemistry and its applications. It includes end-of chapter questions and problems, and a solutions manual is available upon qualifying course adoptions. Rather than immediately discussing specific environmental problems, Manahan systematically develops the concept of environmental chemistry so that when he covers

specific pollution problems the background necessary to understand the problem has already been developed. New in the Ninth Edition: revised discussion of sustainability and environmental science updates information on chemical fate and transport, cycles of matter examination of the connection between environmental chemistry and green chemistry coverage of transgenic crops the role of energy in sustainability potential use of toxic substances in terrorist attacks Manahan emphasizes the importance of the anthrosphere – that part of the environment made and operated by humans and their technologies. Acknowledging technology will be used to support humankind on the planet, it is important that the anthrosphere be designed and operated in a manner that is compatible with sustainability and that it interacts constructively with the other environmental spheres. With clear explanations, real-world examples, and updated questions and answers, the book emphasizes the concepts essential to the practice of environmental science, technology, and chemistry while introducing the newest innovations in the field. Readily adapted for classroom use, a solutions manual is available with qualifying course adoption.

How is the future world energy demand to be met? The rates of use of the fossil fuels — coal, oil and natural gas — are increasing all over the world. The remaining stocks are finite and are not renewable. This book considers the various options of renewable energy, including water energy, wind energy and biomass, solar thermal and solar photovoltaic energy. And should the nuclear option remain open? The work also examines the environmental implications and economic viability of all fossil and renewable sources, introduces more distant future options of geothermal energy and nuclear fusion, and discusses a near-future energy strategy.

This textbook has been in constant use since 1980, and this edition represents the first major revision of this text since the second edition. It was time to select, make hard choices of material, polish, refine, and fill in where needed. Much has been rewritten to be even cleaner and clearer, new features have been introduced, and some peripheral topics have been removed. The authors continue to provide real-world, technical applications that promote intuitive reader learning. Numerous fully worked examples and boxed and numbered formulas give students the essential practice they need to learn mathematics. Computer projects are given when appropriate, including BASIC, spreadsheets, computer algebra systems, and computer-assisted drafting. The graphing calculator has been fully integrated and calculator screens are given to introduce computations. Everything the technical student may need is included, with the emphasis always on clarity and practical applications.

This monograph develops a generalised energy flow theory to investigate non-linear dynamical systems governed by ordinary differential equations in phase space and often met in various science and engineering fields. Important nonlinear phenomena such as, stabilities, periodical orbits, bifurcations and chaos are tackled and the corresponding energy flow behaviors are revealed using the proposed energy flow approach. As examples, the common interested nonlinear dynamical systems, such as, Duffing's oscillator, Van der Pol's equation, Lorenz attractor, Rössler one and SD oscillator, etc, are discussed. This monograph lights a new energy flow research direction for nonlinear dynamics. A generalised Matlab code with User Manual is provided for readers to conduct the energy flow analysis of their nonlinear dynamical systems. Throughout the monograph the author continuously returns to some examples in each chapter to illustrate the applications of the discussed theory and approaches. The book can be used as an undergraduate or graduate textbook or a comprehensive source for scientists, researchers and engineers, providing the statement of the art on energy flow or power flow theory and methods.

“Inspiring people to care about the planet.” In the new edition of ESSENTIALS OF ECOLOGY, authors Tyler Miller and Scott Spoolman have partnered with the National Geographic Society to develop a text designed to equip students with the inspiration and knowledge they need to make a difference solving today's environmental issues. Exclusive content highlights important work of National Geographic Explorers, and features over 100 new photos, maps, and illustrations that bring course concepts to life. Using sustainability as the integrating theme, ESSENTIALS OF ECOLOGY 7e, covers scientific principles and concepts, ecosystems, evolution, biodiversity, population ecology, and more. In addition to the integration of new and engaging National Geographic content, every chapter has been thoroughly updated and 6 new Core Case Studies offer current examples of environmental problems and scenarios for potential solutions. The concept-centered approach used in the text transforms complex environmental topics and issues into key concepts that students will understand and remember. Overall, by framing the concepts with goals for more sustainable lifestyles and human communities, students see how promising the future can be and their important role in shaping it. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Following in the successful footsteps of the "Anatomy" and the "Physiology Coloring Workbook", The Princeton Review introduces two new coloring workbooks to the line. Each book features 125 plates of computer-generated, state-of-the-art, precise, original artwork--perfect for students enrolled in allied health and nursing courses, psychology and neuroscience, and elementary biology and anthropology courses.

Specialist Periodical Reports provide systematic and detailed review coverage of progress in the major areas of chemical research. Written by experts in their specialist fields the series creates a unique service for the active research chemist, supplying regular critical in-depth accounts of progress in particular areas of chemistry. For over 80 years the Royal Society of Chemistry and its predecessor, the Chemical Society, have been publishing reports charting developments in chemistry, which originally took the form of Annual Reports. However, by 1967 the whole spectrum of chemistry could no longer be contained within one volume and the series Specialist Periodical Reports was born. The Annual Reports themselves still existed but were divided into two, and subsequently three, volumes covering Inorganic, Organic and Physical Chemistry. For more general coverage of the highlights in chemistry they remain a 'must'. Since that time the SPR series has altered according to the fluctuating degree of activity in various fields of chemistry. Some titles have remained unchanged, while others have altered their emphasis along with their titles; some have been combined under a new name whereas others have had to be discontinued. The current list of Specialist Periodical Reports can be seen on the inside flap of this volume.

Medical professionals will be able to connect the science of biology to their own lives through the stunning visuals in Visualizing Human Biology. The important concepts of human biology are presented as they relate to the world we live in. The role of the human in the environment is stressed throughout, ensuring that topics such as evolution, ecology, and chemistry are introduced in a non-threatening and logical fashion. Illustrations and visualization features are help make the concepts easier to understand. Medical professionals will appreciate this visual and concise approach.

Temperature affects everything. It influences all aspects of the physical environment and governs any process that involves a flow of energy, setting boundaries on what an organism can or cannot do. This novel textbook reveals the key principles behind the complex relationship between organisms and temperature, namely the science of thermal ecology. It starts by providing a rigorous framework for understanding the flow of energy in and out of the organism, before describing the influence of temperature on what an organism can do. With these fundamental principles covered, the book's final section explores thermal ecology itself, incorporating the important extra dimension of interactions with other organisms. An entire chapter is devoted to the

crucially important subject of how organisms are responding to climate change. Indeed, the threat of rapid climatic change on a global scale is a stark reminder of the challenges that remain for evolutionary thermal biologists, and adds a sense of urgency to this book's mission.

Sustainability is the integrating theme of this current and thought-provoking book. LIVING IN THE ENVIRONMENT provides the basic scientific tools for understanding and thinking critically about the environment. Co-authors G. Tyler Miller and Scott Spoolman inspire students to take a positive approach toward finding and implementing useful environmental solutions in their own lives and in their careers. Updated with the most up-to-date information, art, and Good News examples, the text engages and motivates students with vivid case studies and hands-on quantitative exercises. The concept-centered approach transforms complex environmental topics and issues into key concepts that students will understand and remember. Overall, by framing the concepts with goals for more sustainable lifestyles and human communities, students see how promising the future can be. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This book presents studies on the surface modification of aluminum and titanium alloys by electric explosive alloying and electron-beam processing. It also describes and analyzes the physical mechanism of energy actions of these technologies on physical and mechanical properties and discusses their potential use in industry to improve the characteristics of finished products. The book is intended for specialists in the field of condensed matter physics, metallurgy and heat treatment and materials science, as well as graduate and senior students in relevant fields.

Filling the need for a ready reference that reflects the vast developments in this field, this book presents everything from fundamentals, applications, various reaction types, and technical applications. Edited by rising stars in the scientific community, the text focuses solely on visible light photocatalysis in the context of organic chemistry. This primarily entails photoinduced electron transfer and energy transfer chemistry sensitized by polypyridyl complexes, yet also includes the use of organic dyes and heterogeneous catalysts. A valuable resource to the synthetic organic community, polymer and medicinal chemists, as well as industry professionals.

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