Crispr Cas A Laboratory

Bridging the gap between basic scientific advances and the understanding of liver disease – the extensively revised new edition of the premier text in the field. The latest edition of The Liver: Biology and Pathobiology remains a definitive volume in the field of hepatology, relating advances in biomedical sciences and engineering to understanding of liver structure, function, and disease pathology and treatment. Contributions from leading researchers examine the cell biology of the liver, the pathobiology of liver disease, the liver's growth, regeneration, metabolic functions, and more. Now in its sixth edition, this classic text has been exhaustively revised to reflect new discoveries in biology and their influence on diagnosing, managing, and preventing liver disease. Seventy new chapters – including substantial original sections on liver cancer and groundbreaking advances that will have significant impact on hepatology – provide comprehensive, fully up-to-date coverage of both the current state and future direction of hepatology. Topics include liver RNA structure and function, gene editing, single-cell and single-molecule genomic analyses, the molecular biology of hepatitis, drug interactions and engineered drug design, and liver disease mechanisms and therapies. Edited by globally-recognized experts in the field, this authoritative volume: Relates molecular physiology to understanding disease pathology and treatment Links the science and pathology of the liver to practical clinical applications Features 16 new "Horizons" chapters that explore new and emerging science and technology Includes plentiful full-color illustrations and figures The Liver: Biology and Pathobiology, Sixth Edition is an indispensable resource for practicing and trainee hepatologists, gastroenterologists, hepatobiliary and liver transplant surgeons, and researchers and scientists in areas including hepatology, cell and molecular biology, virology, and drug metabolism.

This book tells the dramatic story of Crispr and the potential impact of this gene-editing technology.

This book offers a comprehensive collection of papers on CRISPR/Cas genome editing in connection with agriculture, climate-smart crops, food security, translational research applications, bioinformatics analysis, practical applications in cereals, floriculture crops, engineering plants for abiotic stress resistance, the intellectual landscape, regulatory framework, and policy decisions. Gathering contributions by internationally respected experts in the field of CRISPR/Cas genome editing, the book offers an essential guide for researchers, students, teachers and scientists in academia; policymakers; and public companies, private companies and cooperatives interested in understanding and/or applying CRISPR/Cas genome editing to develop new agricultural products.

Innovations in molecular biology are allowing neuroscientists to study the brain with unprecedented resolution, from the level of single molecules to integrated gene circuits. Chief among these innovations is the CRISPR-Cas genome editing technology, which has the precision and scalability to tackle the complexity of the brain. This Colloque Médecine et Recherche has brought together experts from around the world that are applying genome editing to address important challenges in neuroscience, including basic biology in model organisms that has the power to reveal systems-level insight into how the nervous system develops and functions as well as research focused on understanding and treating human neurological disorders. This work was published by Saint Philip Street Press pursuant to a Creative Commons license permitting commercial use. All rights not granted by the work's license are retained by the author or authors.

Tomorrow's Table

The Code Breaker

Gene Drives on the Horizon

Adaptation and Natural Selection

Reprogramming the Genome: Applications of CRISPR-Cas in non-mammalian systems part B

Human Genome Editing

By the year 2050, Earth's population will double. If we continue with current farming practices, vast amounts of wilderness will be lost, millions of birds and billions of insects will die, and the public will lose billions of dollars as a consequence of environmental degradation. Clearly, there must be a better way to meet the need for increased food production. Written as part memoir, part instruction, and part contemplation, Tomorrow's Table argues that a judicious blend of two important strands of agriculture--genetic engineering and organic farming--is key to helping feed the world's

growing population in an ecologically balanced manner. Pamela Ronald, a geneticist, and her husband, Raoul Adamchak, an organic farmer, take the reader inside their lives for roughly a year, allowing us to look over their shoulders so that we can see what geneticists and organic farmers actually do. The reader sees the problems that farmers face, trying to provide larger yields without resorting to expensive or environmentally hazardous chemicals, a problem that will loom larger and larger as the century progresses. They learn how organic farmers and geneticists address these problems. This book is for consumers, farmers, and policy decision makers who want to make food choices and policy that will support ecologically responsible farming practices. It is also for anyone who wants accurate information about organic farming, genetic engineering, and their potential impacts on human health and the environment.

This open access book provides original, up-to-date case studies of "ethics dumping" that were largely facilitated by loopholes in the ethics governance of low and middle-income countries. It is instructive even to experienced researchers since it provides a voice to vulnerable populations from the fore mentioned countries. Ensuring the ethical conduct of North-South collaborations in research is a process fraught with difficulties. The background conditions under which such collaborations take place include extreme differentials in available income and power, as well as a past history of colonialism, while differences in culture can add a new layer of complications. In this context, up-to-date case studies of unethical conduct are essential for research ethics training.

CRISPR/Cas is a recently described defense system that protects bacteria and archaea against invasion by mobile genetic elements such as viruses and plasmids. A wide spectrum of distinct CRISPR/Cas systems has been identified in at least half of the available prokaryotic genomes. On-going structural and functional analyses have resulted in a far greater insight into the functions and possible applications of these systems, although many secrets remain to be discovered. In this book, experts summarize the state of the art in this exciting field.

A Best Book of 2021 by Bloomberg BusinessWeek, Time, and The Washington Post The bestselling author of Leonardo da Vinci and Steve Jobs returns with a "compelling" (The Washington Post) account of how Nobel Prize winner Jennifer Doudna and her colleagues launched a revolution that will allow us to cure diseases, fend off viruses, and have healthier babies. When Jennifer Doudna was in sixth grade, she came home one day to find that her dad had left a paperback titled The Double Helix on her bed. She put it aside, thinking it was one of those detective tales she loved. When she read it on a rainy Saturday, she discovered she was right, in a way. As she sped through the pages, she became enthralled by the intense drama behind the competition to discover the code of life. Even though her high school counselor told her girls didn't become scientists, she decided she would. Driven by a passion to understand how nature works and to turn discoveries into inventions, she would help to make what the book's author, James Watson, told her was the most important biological advance since his codiscovery of the structure of DNA. She and her collaborators turned a curiosity of nature into an invention that will transform the human race: an easy-to-use tool that can edit DNA. Known as CRISPR, it opened a brave new world of medical miracles and moral questions. The development of CRISPR and the race to create vaccines for coronavirus will hasten our transition to the next great innovation revolution. The past half-century has been a digital age, based on the microchip, computer, and internet. Now we are entering a life-science revolution. Children who study digital coding will be joined by those who study genetic code. Should we use our new evolution-hacking powers to make us less susceptible to viruses? What a wonderful boon that would be! And what about preventing depression? Hmmm…Should we allow parents, if they can afford it, to enhance the height or muscles or IQ of their kids? After helping to discover CRISPR, Doudna became a leader in wrestling with these moral issues and, with her collaborator Emmanuelle Charpentier, won the Nobel Prize in 2020. Her story is an "enthralling detective story" (Oprah Daily) that involves the most profound wonders of nature, from the origins of life to the future of our species.

Technical Advances and New Therapeutic Opportunities

CRISPR-Cas Methods

CRISPR-CAS METHODS

From Life's Origins to Diversity in Gene Regulation

RNA-mediated Adaptive Immunity in Bacteria and Archaea

RNA Interference and CRISPR Technologies

BY THE WINNER OF THE 2020 NOBEL PRIZE IN CHEMISTRY ¦ Finalist for the Los Angeles Times Book Prize " A powerful mix of science and ethics . . . This book is required reading for every concerned citizen—the material it covers should be discussed in schools, colleges, and universities throughout the country. " — New York Review of Books Not since the atomic bomb has a technology so alarmed its inventors that they warned the world about its use. That is, until 2015, when biologist Jennifer Doudna called for a worldwide moratorium on the use of the gene-editing tool CRISPR—a revolutionary new technology that she helped create—to make heritable changes in human embryos. The cheapest, simplest, most effective way of manipulating DNA ever known, CRISPR may well give us the cure to HIV, genetic diseases, and some cancers. Yet even the tiniest changes to DNA could have myriad, unforeseeable consequences, to say nothing of the ethical and societal repercussions of intentionally mutating embryos to create " better " humans. Writing with fellow researcher Sam Sternberg, Doudna—who has since won the Nobel Prize for her CRISPR research—shares the thrilling story of her discovery and describes the enormous responsibility that comes with the power to rewrite the code of life. " The future is in our hands as never before, and this book explains the stakes like no other. " — George Lucas " An invaluable account . . . We owe Doudna several times over. " — Guardian

Since its discovery as a part of the bacterial defense mechanism, the Nobel Prize-winning technology CRISPR-Cas system has revolutionized the fields of genome editing and genetic engineering. Beyond gene-editing ability, scientists have leveraged its potential in the diagnosis of infectious diseases including COVID-19. This book provides a detailed understanding of CRISPR-based rapid and point-of-care diagnostic kits like SHERLOCK, DETECTR, FELUDA, AIOD CRISPR-Cas12a, etc. Although these CRISPR-based tests are performed using isothermal nucleic acid amplification processes like RPA and

LAMP, they promise a real-time RT-PCR sensitivity. Furthermore, the tests ' results can be interpreted using paper-based lateral flow strips, potentially reducing laboratory and test costs. In this technique, the colored lines on the strip, similar to pregnancy tests, indicate whether the test is positive or negative. Because of the ease of performing the test and simple interpretation of the test results, CRISPR-based tests can be used at airports, ports, clinics, schools, etc., for better disease diagnosis, monitoring, management, and containment of infectious diseases like COVID-19. Additionally, the book also discusses Monoclonal Antibodies, which have revolutionized the treatment for cancer, arthritis, autoimmune diseases, etc. This book also talks about various strategies to isolate monoclonal antibodies from the COVID-19 recovered people and different ways to engineer these antibodies using hybridoma technology.

One of the world's leading experts on genetics unravels one of the most important breakthroughs in modern science and medicine. IIf our genes are, to a great extent, our destiny, then what would happen if mankind could engineer and alter the very essence of our DNA coding? Millions might be spared the devastating effects of hereditary disease or the challenges of disability, whether it was the pain of sickle-cell anemia to the ravages of Huntington ' s disease. But this power to " play God " also raises major ethical questions and poses threats for potential misuse. For decades, these questions have lived exclusively in the realm of science fiction, but as Kevin Davies powerfully reveals in his new book, this is all about to change. Engrossing and page-turning, Editing Humanity takes readers inside the fascinating world of a new gene editing technology called CRISPR, a high-powered genetic toolkit that enables scientists to not only engineer but to edit the DNA of any organism down to the individual building blocks of the genetic code. Davies introduces readers to arguably the most profound scientific breakthrough of our time. He tracks the scientists on the front lines of its research to the patients whose powerful stories bring the narrative movingly to human scale. Though the birth of the " CRISPR babies " in China made international news, there is much more to the story of CRISPR than headlines seemingly ripped from science fiction. In Editing Humanity, Davies sheds light on the implications that this new technology can have on our everyday lives and in the lives of generations to come.

Synthetic biology involves the rational design and construction of biological components and systemsfrom genetic elements and metabolic pathways to entirely new organisms. Progress in this field has been rapid, and it promises to significantly expand our capabilities in biotechnology, medicine, and agriculture. Written and edited by experts in the field, this collection from Cold Spring Harbor Perspectives in Biology examines the tools and techniques employed by synthetic biologists, how these may be used to develop new drugs, diagnostic approaches, food sources, and clean energy, and what the field of synthetic biology has taught us about natural living systems. The contributors discuss advances in DNA synthesis and assembly, genome editing (e.g., CRISPR/Cas9), and artificial genetic systems. Progress in designing complex genetic switches and circuits, expanding the genetic code, modifying cellular organization, producing proteins using cell-free systems, and developing biodesign automation tools is also covered. The authors also explore ways to produce new organisms and products that have particular attributesfor example, microbial "molecular factories," synthetic organs and tissues, and plants with novel traits. This volume is an essential resource for molecular, cell, and systems biologists who seek to engineer living systems for human benefit.

Volume Ii

Strategies And Potential For Crop Improvement

Jennifer Doudna, Gene Editing, and the Future of the Human Race

Advances in Research and Applications

CRISPR-Cas system based diagnosis of infectious diseases

ZFNs, TALENs, and the CRISPR/Cas9 System

This new volume of Methods in Enzymology continues the legacy of this premier serial with quality chapters authored by leaders in the field. This volume covers recent research and methods development for changing the DNA sequence within the genomes of cells and organisms. Focusing on enzymes that generate double-strand breaks in DNA, the chapters describe use of molecular tools to introduce or delete genetic information at specific sites in the genomes of animal, plant and bacterial cells. Continues the legacy of this premier serial with quality chapters authored by leaders in the field Covers research methods in biomineralization science Contains sections on such topics as genome editing, genome engineering, CRISPR, Cas9, TALEN and zinc finger nuclease

Since their discovery and subsequent development into laboratory tools, CRISPR-Cas systems have revolutionized the science of gene editing and their possible applications continue to expand, from basic research to potentially groundbreaking medical and commercial uses. Led by a distinguished team of editors, CRISPR: Biology and Applications explores the subject matter needed to delve into this fascinating area. This comprehensive text presents the diversity of CRISPR-Cas systems, the underlying biology of these systems, and CRISPR-based technologies and applications. Topics covered include: Classification and molecular mechanisms of CRISPR-Cas systems CRISPR-Cas evolution, regulation, expression, and function Uses for gene editing and modulation of gene expression CRISPR-based antimicrobials and phage resistance for medical and industrial purposes Written by internationally renowned authors, CRISPR: Biology and Applications serves as both an introductory guide for those new to the field and a ready reference for seasoned researchers whose work touches this evolving and headline-making science.

CRISPR-Cas Enzymes, Volume 616, the latest release in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. Topics covered in this release include CRISPR bioinformatics, A method for one-step assembly of Class 2 CRISPR arrays, Biochemical reconstitution and structural analysis of ribonucleoprotein complexes in Type I-E CRISPR-Cas systems, Mechanistic dissection of the CRISPR interference pathway in Type I-E CRISPR-Cas system, Site-specific fluorescent labeling of individual proteins within CRISPR complexes, Fluorescence-based methods for measuring target interference by CRISPR-Cas systems, Native State Structural Characterization of CRISRP Associated Complexes using Mass Spectrometry, and more. Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Methods in Enzymology series Updated release includes the latest information on the CRISPR-Cas Enzymes

Biological evolution is a fact—but the many conflicting theories of evolution remain controversial even today. When Adaptation and Natural Selection was first published in 1966, it struck a powerful blow against those who argued for the concept of group selection—the idea that evolution acts to select entire species rather than individuals. Williams's famous work in favor of simple Darwinism over group selection has become a classic of science literature, valued for its thorough and convincing argument and its relevance to many fields outside of biology. Now with a new foreword by Richard Dawkins, Adaptation and Natural Selection is an essential text for understanding the nature of scientific debate.

The CRISPR Revolution and the New Era of Genome Editing
Genome Editing in Neurosciences
Editing Humanity
Synthetic Biology
CRISPR Gene Editing
RNA Worlds

This second volume provides new and updated methods detailing advancements in CRISPR-Cas technical protocols. Chapters guide readers through protocols on prime editing, base editing, multiplex editing, editing in cell-free extract, in silico analysis of gRNA secondary structure and CRISPR-diagnosis. Authoritative and cutting-edge, CRISPR-Cas Methods, Volume 2 aims to serves as a laboratory manual providing scientists with a holistic view of CRISPR-Cas methodologies and its practical application for the editing of crop plants, cell lines, nematode and microorganism.

This volume presents a list of cutting-edge protocols for the study of CRISPR-Cas defense systems and their applications at the genomic, genetic, biochemical and structural levels. CRISPR: Methods and Protocols guides readers through techniques that have been developed specifically for the analysis of CRISPR-Cas and techniques adapted from standard protocols of DNA, RNA and protein biology. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and cutting-edge, CRISPR: Methods and Protocols provides a broad list of tools and techniques to study the interdisciplinary aspects of the prokaryotic CRISPR-Cas defense systems.

The CRISPR-Cas9 genome-editing system is creating a revolution in the science world. In the laboratory, CRISPR-Cas9 can efficiently be used to target specific genes, correct mutations and regulate gene expression of a wide array of cells and organisms, including human cells. CRISPR-/Cas9 Based Genome Editing for Treating Genetic Disorders and Diseases is a unique reading material for college students, academicians, and other health professionals interested in learning about the broad range of applications of CRISPR/Cas9 genetic scissors. Some topics included in this book are: the role of the CRISPR/Cas9 system in neuroscience, gene therapy, epigenome editing, genome mapping, cancer, virus infection control strategies, regulatory challenges and bioethical considerations.

Research on gene drive systems is rapidly advancing. Many proposed applications of gene drive research aim to solve environmental and public health challenges, including the reduction of poverty and the burden of vector-borne diseases, such as malaria and dengue, which disproportionately impact low and middle income countries. However, due to their intrinsic qualities of rapid spread and irreversibility, gene drive systems raise many questions with respect to their safety relative to public and environmental health. Because gene drive systems are designed to alter the environments we share in ways that will be hard to anticipate and impossible to completely roll back, questions about the ethics surrounding use of this research are complex and will require very careful exploration. Gene Drives on the Horizon outlines the state of knowledge relative to the science, ethics, public engagement, and risk assessment as they pertain to research directions of gene drive systems and governance of the research process. This report offers principles for responsible practices of gene drive research and related applications for use by investigators, their institutions, the research funders, and regulators.

Biology and Applications
Reprogramming the Genome: CRISPR-Cas-based Human Disease Therapy
CRISPR/Cas Genome Editing
From TALENs, ZFNs and CRISPRs to Molecular Surgery
The Liver
Genome Editing and Engineering

The development of CRISPR-Cas technology is revolutionizing biology. Based on machinery bacteria use to target foreign DNA, these powerful techniques allow investigators to edit DNA sequences and modulate gene expression more rapidly and accurately than ever before. Featuring contributions from leading figures in the CRISPR-Cas field, this laboratory manual presents a state-of-the-art guide to the technology. It includes step-by-step protocols for applying CRISPR-Cas-based techniques in various systems, including yeast, zebrafish, Drosophila, mice, and cultured cells (e.g., human pluripotent stem cells). The contributors cover web-based tools and approaches for designing guide RNAs that precisely target genes of interest, methods for preparing and delivering CRISPR-Cas reagents into cells, and ways to screen for cells that harbor the desired genetic changes. Strategies for optimizing CRISPR-Cas in each system-especially for minimizing off-target effects-are also provided. Authors also describe other applications of the CRISPR-Cas system, including its use for regulating genome activation and repression, and discuss the development of next-generation CRISPR-Cas tools. The book is thus an

essential laboratory resource for all cell, molecular, and developmental biologists, as well as biochemists, geneticists, and all who seek to expand their biotechnology toolkits. This detailed volume guides readers through strategic planning and user-friendly guidelines in order to select the most suitable CRISPR-Cas system and target sites with high activity and specificity. Methods covering CRISPR gRNA design, CRISPR delivery, CRISPR activity quantification (indel quantification), and examples of applying CRISPR gene editing in human pluripotent stem cells, primary cells, gene therapy, and genetic screening are included. Written for the highly successful Methods in Molecular Biology series, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and invaluable, CRISPR Gene Editing: Methods and Protocols will assist undergraduates, graduates, and researchers with detailed guidelines and methods for the vitally important CRISPR gene editing field. Chapter 3 is available open access under a CC BY 4.0 license via link.springer.com.
Reprogramming the Genome: CRISPR-Cas-based Human Disease Therapy, presents the collation of chapters written by eminent scientists worldwide. CRISPR-Cas9 is a key technology for targeted genome editing and regulation in a number of organisms including mammalian cells. It is a rapid, simple, and cost-effective solution. CRISPR-Cas system has recently gained much scientific and public attention. This volume covers CRISPR-Cas9 based mammalian genome editing, creating disease models, cancer therapy, neurological, heredity, blood disorders, defective gene correction, stem cells therapy, epigenetic modifications, patents, ethics, biosafety and regulatory issues challenges and opportunities. This book is a key source of information on mammalian genome editing available in a single volume. This book will be useful for beginners in mammalian genome editing and also students, researchers, scientists, policymakers, clinicians and stakeholders interested in genome editing in several areas. Offers basic understanding and a clear picture of mammalian genome editing through CRISPR-Cas systems Discusses how to create mammalian disease models, stem cell modification, epigenetic modifications, correction of defective gene in blood disorders, heredity, neurological disorders and many more Discusses the application of CRISPR-Cas9 systems in basic sciences, biomedicine, molecular biology, translational sciences, neurobiology, neurology, cancer, stem cells, and many more
A trailblazing biologist grapples with her role in the biggest scientific discovery of our era: a cheap, easy way of rewriting genetic code, with nearly limitless promise and peril.
Heritable Human Genome Editing
Case Studies from North-South Research Collaborations
CRISPR
Advancing Science, Navigating Uncertainty, and Aligning Research with Public Values
CRISPR-Cas Systems
CRISPR-Cas Enzymes

This volume explores the uses of RNAi and CRISPR interferences as a general method for inhibiting gene expression, with focus on their biological functions, design, chemical modifications, delivery, and preclinical/clinical applications. In addition to relevant backgrounds, the chapters in this book discuss simple and accurate protocols dealing with the latest advances in RNAi and CRISPR applications and look at how these methods differ from one another. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Comprehensive and cutting-edge, RNA Interference and CRISPR Technologies: Technical Advances and New Therapeutic Opportunities is a valuable resource for any scientist, teachers, graduate student, postdoc, and clinician interested in this field. This book also benefits anyone in research and development in biotech and pharmaceutical companies who want to understand more about these technologies, and their applications in biology and medicine. .

Once thought to be just a messenger that allows genetic information encoded in DNA to direct the formation of proteins, RNA (ribonucleic acid) is now known to be a highly versatile molecule that has multiple roles in cells. It can function as an enzyme, scaffold various subcellular structures, and regulate gene expression through a variety of mechanisms, as well as act as a key component of the protein synthesis and splicing machinery. Perhaps most interestingly, increasing evidence indicates that RNA preceded DNA as the hereditary material and played a crucial role in the early evolution of life on Earth. This volume reviews our understanding of two RNA worlds: the primordial RNA world before DNA, in which RNA was both information store and biocatalyst; and the contemporary RNA world, in which mRNA, tRNA, rRNA, siRNA, miRNA, and a host of other RNAs operate. The early chapters of the book analyze the role of RNA in the first life forms and the appearance of cells. Subsequent chapters examine riboswitches and ribozymes, establishing what the RNA molecule is capable of alone. The book goes on to discuss the evolution of ribosomes and the functions of RNPs, before reviewing the recent work that has revolutionized our understanding of gene regulation by non-coding RNAs, including miRNAs and siRNAs. Also covered are viral RNAs, telomerase RNA, and tools for scientists who work on RNA. The book is thus essential reading for all molecular biologists and biochemists, as well as chemists interested in RNA technology, information storage, or enzyme catalysis.

A complete guide to endonuclease-based genomic engineering, from basic science to application in disease biology and clinical treatment.

Genome editing using CRISPR has been identified as one breakthrough technology in recent research. Today, it is difficult to open a journal or a newspaper without reading about the application of CRISPR gene editing technology to basic research, public health, therapeutics or diagnostics. Although some problems of CRISPR remain to be solved, such as bio-safety and ethical issues, it may change peoples futures. This book is to meet the needs of basic molecular biochemists, pharmacologists, medical students, clinical practitioners and scientists, as well as a broad spectrum of readers who wish to understand the advances in research and applications of CRISPR. The contributing authors are basic scientists as well as students who major in biochemistry and pharmacology. The book presents the current research in the CRISPR model, focusing on its advances and applications. Topics discussed in this compilation include: Targeting of hepatic diseases using CRISPR; applications and advances of CRISPR in animal models; gene targeting on the Cyp2c Locus in rats via CRISPR; applications of CRISPR for therapy in human genetic diseases; utilization of CRISPR in gene function and drug target validation; applications

of CRISPR in plant genome editing; and genome editing on human embryos using CRISPR.
Gene Editing and the Unthinkable Power to Control Evolution
Reprogramming the Genome: Applications of CRISPR-Cas in non-mammalian systems part A
CRISPR-Cas in Agriculture: Opportunities and Challenges
Volume 2
Organic Farming, Genetics, and the Future of Food
Methods and Protocols

Gene Editing in Plants, Volume 149 aims to provide the reader with an up-to-date survey of cutting-edge research with gene editing tools and an overview of the implications of this research on the nutritional quality of fruits, vegetables and grains. New chapters in the updated volume include topics relating to Genome Engineering and Agriculture: Opportunities and Challenges, the Use of CRISPR/Cas9 for Crop Improvement in Maize and Soybean, the Use of Zinc-Finger Nucleases for Crop Improvement, Gene Editing in Polyploid Crops: Wheat, Camelina, Canola, Potato, Cotton, Peanut, Sugar Cane, and Citrus, and Gene Editing With TALEN and CRISPR/Cas in Rice. This ongoing serial contain contributions from leading scientists and researchers in the field of gene editing in plants who describe the results of their own research in this rapidly expanding area of science. Shows the importance of revolutionary gene editing technology on plant biology research and its application to agricultural production Provides insight into what may lie ahead in this rapidly expanding area of plant research and development Contains contributions from major leaders in the field of plant gene editing

This second volume provides new and updated methods detailing advancements in CRISPR-Cas technical protocols. Chapters guide readers through protocols on prime editing, base editing, multiplex editing, editing in cell-free extract, in silico analysis of gRNA secondary structure and CRISPR-diagnosis. Authoritative and cutting-edge, CRISPR-Cas Methods, Volume 2 aims to serves as a laboratory manual providing scientists with a holistic view of CRISPR-Cas methodologies and its practical application for the editing of crop plants, cell lines, nematode and microorganism. The chapter "CRISPR/Cas9-mediated gene editing in human induced pluripotent stem cells" is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

Genome editing is a powerful new tool for making precise alterations to an organism's genetic material. Recent scientific advances have made genome editing more efficient, precise, and flexible than ever before. These advances have spurred an explosion of interest from around the globe in the possible ways in which genome editing can improve human health. The speed at which these technologies are being developed and applied has led many policymakers and stakeholders to express concern about whether appropriate systems are in place to govern these technologies and how and when the public should be engaged in these decisions. Human Genome Editing considers important questions about the human application of genome editing including: balancing potential benefits with unintended risks, governing the use of genome editing, incorporating societal values into clinical applications and policy decisions, and respecting the inevitable differences across nations and cultures that will shape how and whether to use these new technologies. This report proposes criteria for heritable germline editing, provides conclusions on the crucial need for public education and engagement, and presents 7 general principles for the governance of human genome editing.

Heritable human genome editing - making changes to the genetic material of eggs, sperm, or any cells that lead to their development, including the cells of early embryos, and establishing a pregnancy - raises not only scientific and medical considerations but also a host of ethical, moral, and societal issues. Human embryos whose genomes have been edited should not be used to create a pregnancy until it is established that precise genomic changes can be made reliably and without introducing undesired changes - criteria that have not yet been met, says Heritable Human Genome Editing. From an international commission of the U.S. National Academy of Medicine, U.S. National Academy of Sciences, and the U.K.'s Royal Society, the report considers potential benefits, harms, and uncertainties associated with genome editing technologies and defines a translational pathway from rigorous preclinical research to initial clinical uses, should a country decide to permit such uses. The report specifies stringent preclinical and clinical requirements for establishing safety and efficacy, and for undertaking long-term monitoring of outcomes. Extensive national and international dialogue is needed before any country decides whether to permit clinical use of this technology, according to the report, which identifies essential elements of national and international scientific governance and oversight.

Gene Editing in Plants
Plant Genome Editing – Policies and Governance
CRISPR-/Cas9 Based Genome Editing for Treating Genetic Disorders and Diseases
Tools for Engineering Biological Systems

A Crack In Creation

Genome Engineering via CRISPR-Cas9 System

Reprogramming the Genome: Applications of CRISPR-Cas in Non-mammalian Systems Part B, represents the collation of chapters written by eminent scientists worldwide. CRISPR-Cas9 system is an RNA-mediated immune system of bacteria and archaea that protects from bacteriophage infections. It is one of the revolutionized technologies to uplift biology to the next stages. It is a simple, rapid, precise, and cost-effective tool for genome editing and regulation of a wide range of organisms. It has gained scientific and public attention worldwide. This volume mainly covers insect cell line, protozoans, zebrafish, drosophila, CRISPRi, patents as well as technology transfer, and many more. This book is a key source of information available in a single volume. This book will be useful for not only beginners in genome engineering, but also students, researchers, scientists, policymakers, and stakeholders interested in harnessing the potential of reprogramming of the genomes in several areas. Offers basic understanding and a clear picture of genome editing CRISPR-Cas systems in different organisms Explains how to create an animal model for disease diagnosis/research and reprogram CRISPR for insect cell line, protozoans, zebrafish, drosophila, and many more Discusses the advances, patents, applications, challenges and opportunities in CRISPR-Cas9 systems in basic sciences, biomedicine, molecular biology and many more

Reprogramming the Genome: Applications of CRISPR-Cas in Non-mammalian Systems, Part A presents a collation of chapters written by global, eminent scientists. CRISPR-Cas9 system is an RNA-mediated immune system of bacteria and archaea that protects from bacteriophage infections. It is one of the revolutionized technologies to uplift biology to the next stages. Chapters in this release include An Introduction and applications of CRISPR-Cas Systems, History, evolution and classification of CRISPR-Cas associated systems, CRISPR based bacterial genome editing and removal of pathogens, CRISPR based genome editing and removal of human viruses, CRISPR based development of RNA editing and diagnostic platform, and much more. Additional sections cover Genome engineering in insects for control of vector borne diseases, Development of insect cell line using CRISPR technology, CRISPRing protozoan parasites to better understand the biology of diseases, CRISPR based genome editing of Caenorhabditis elegans, and a variety of other important topics. Offers a basic understanding and clear picture of genome editing CRISPR-Cas systems in different organisms Explains how to create an animal model for disease diagnosis/research and reprogram CRISPR for removal of virus, bacteria, fungi, protozoan, and many more Discusses the advances, patents, applications, challenges and opportunities in CRISPR-Cas9 systems in basic sciences, biomedicine, virology, bacteriology, molecular biology, and many more

This book serves as an introduction to targeted genome editing, beginning with the background of this rapidly developing field and methods for generation of engineered nucleases. Applications of genome editing tools are then described in detail, in iPS cells and diverse organisms such as mice, rats, marine invertebrates, fish, frogs, and plants. Tools that are mentioned include zinc finger nucleases (ZFNs), transcription activator-like effector nucleases (TALENs), and CRISPR/Cas9, all of which have received much attention in recent years as breakthrough technologies. Genome editing with engineered nucleases allows us to precisely change the target genome of living cells and is a powerful way to control functional genes. It is feasible in almost all organisms ranging from bacteria to plants and animals, as well as in cultured cells such as ES and iPS cells. Various genome modifications have proven successful, including gene knockout and knock-in experiments with targeting vectors and chromosomal editing. Genome editing technologies hold great promise for the future, for example in biomedical research, clinical medicine, and generation of crops and livestock with desirable traits. A wide range of readers will find this book interesting, and with its focus on applications in a variety of organisms and cells, the book will be valuable for life scientists in all fields.

Genome Engineering via CRISPR-Cas9 Systems presents a compilation of chapters from eminent scientists from across the globe who have established expertise in working with CRISPR-Cas9 systems. Currently, targeted genome engineering is a key technology for basic science, biomedical and industrial applications due to the relative simplicity to which they can be designed, used and applied. However, it is not easy to find relevant information gathered in a single source. The book contains a wide range of applications of CRISPR in research of bacteria, virus, algae, plant and mammalian and also discusses the modeling of drosophila, zebra fish and protozoan, among others. Other topics covered include diagnosis, sensor and therapeutic applications, as well as ethical and regulatory issues. This book is a valuable source not only for beginners in genome engineering, but also researchers, clinicians, stakeholders, policy makers, and practitioners interested in the potential of CRISPR-Cas9 in several fields. Provides basic understanding and a clear picture on how to design, use and implement the CRISPR-Cas9 system in different organisms Explains how to create an animal model for disease research and screening purposes using CRISPR Discusses the application of CRISPR-Cas9 systems in basic sciences, biomedicine, virology, bacteriology, molecular biology, neurology, cancer, industry, and many more

Crispr-Cas: A Laboratory Manual

Biology and Pathobiology

A Crack in Creation

Science, Ethics, and Governance

Targeted Genome Editing Using Site-Specific Nucleases

The Use of CRISPR/cas9, ZFNs, TALENs in Generating Site-Specific Genome Alterations