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Gene Editing in Plants - 2017-08-31

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

Human Genome Editing - National Academies of Sciences, Engineering, and Medicine 2017-08-13 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.

Insights in Genome Editing in Plants: 2021 - Bing Yang 2022-10-26

Crispr Technology - Paul F. Kisak 2017-06-18

CRISPR is an acronym for Clustered Regularly Interspaced Short Palindromic Repeats which are segments of prokaryotic DNA containing short, repetitive base sequences. These play a key role in a bacterial defense system and form the basis of a genome editing technology known as CRISPR/Cas9 that allows permanent modification of genes within organisms. In a palindromic repeat, the sequence of nucleotides is the same in both directions. Each repetition is followed by short segments of spacer DNA from previous exposures to foreign DNA (e.g., a virus or plasmid). Small clusters of cas (CRISPR-associated system) genes are located next to CRISPR sequences. The CRISPR/Cas system is a prokaryotic immune system that confers resistance to foreign genetic elements such as those present within plasmids and phages that provides a form of acquired immunity. RNA harboring the spacer sequence helps Cas proteins recognize and cut exogenous DNA. Other RNA-guided Cas proteins cut foreign RNA. CRISPRs are found in approximately 40% of sequenced bacterial genomes and 90% of sequenced archaea. A simple version of the CRISPR/Cas system, CRISPR/Cas9, has been modified to edit genomes. By delivering the Cas9 nuclease complexed with a synthetic guide RNA (gRNA) into a cell, the cell's genome can be cut at a desired location, allowing existing genes to be removed and/or new ones added. The Cas9-gRNA complex corresponds with the CAS III crRNA complex in the above diagram. CRISPR/Cas genome editing techniques have many

potential applications, including medicine and crop seed enhancement. The use of CRISPR/Cas9-gRNA complex for genome editing was the AAAS's choice for breakthrough of the year in 2015. Bioethical concerns have been raised about the prospect of using CRISPR for germline editing. This book is designed to be a state of the art, superb academic reference work and provide an overview of the topic and give the reader a structured knowledge to familiarize yourself with the topic at the most affordable price possible. The accuracy and knowledge is of an international viewpoint as the edited articles represent the inputs of many knowledgeable individuals and some of the most current knowledge on the topic, based on the date of publication.

The CRISPR/Cas9 System: Applications and Technology - Alfred A. Bertelsen 2019-08-30

This compilation focuses on the CRISPR/Cas9 system, a genome editing tool that has been hailed as the most profound molecular biology discovery in the past decade. By employing the natural process of bacterial immunity towards bacteriophages, the tool allows researchers to precisely excise and edit parts of the genetic sequence to modify them. The authors summarize the molecular pathogenesis of hepatocellular carcinoma, available treatments/drugs and their limitations, the landscape of CRISPR targeting hepatocellular carcinoma, limitations and potential targets in future. The closing review summarises the use of CRISPR/Cas9 gene editing in ophthalmology and focuses on the advancement of gene editing in the cornea. The majority of corneal dystrophies are the result an autosomal dominant inheritance pattern within the TGFBI gene, which presents an ideal model suited for a CRISPR/Cas9 knock out methodology.

DEVELOPMENT OF EFFICIENT CRISPR-Cas9 METHODS TO INTRODUCE PRECISE GENETIC

MUTATIONS IN CELLS - Martina Fabricci 2020-07-08 An overview of how CRISPR-Cas9 techniques could improve the efficiency of precise mutation in cells. About the Author: Martina Fabricci is a research scientist pursuing a PhD in immunogenomics with a MSc degree in Biotechnology and Molecular Biology with advanced courses from Harvard and MIT. She is the founder of CRISPR Biotech Engineering, a genome editing company. Martina conducts scientific research in the cellular engineering, biotechnology and genome editing fields. Her latest study was focused on the use of CRISPR-Cas9 in people to correct mutations that cause disease, using mainly two techniques. The first involves the development of the Cas9 system from bacteria that do not infect or cause immune responses within the human body. The other method involves tweaking endonuclease Cas9 enzymes to generate engineered forms of the enzyme that is capable of escaping immune responses within the body. Her key focus is on researching and understanding the various CRISPR-Cas9 applications, and exploring the promise it holds for researchers, students, scientists, as well as patients.

Systems and Synthetic Biology - Vikram Singh 2014-12-15 This textbook has been conceptualized to provide a detailed description of the various aspects of Systems and Synthetic Biology, keeping the requirements of M.Sc. and Ph.D. students in mind. Also, it is hoped that this book will mentor young scientists who are willing to contribute to this area but do not know from where to begin. The book has been divided into two sections. The first section will deal with systems biology – in terms of the foundational understanding, highlighting issues in biological complexity, methods of analysis and various aspects of modelling. The second section deals with the engineering concepts, design strategies of the biological systems ranging

from simple DNA/RNA fragments, switches and oscillators, molecular pathways to a complete synthetic cell will be described. Finally, the book will offer expert opinions in legal, safety, security and social issues to present a well-balanced information both for students and scientists.

Reprogramming the Genome: Applications of CRISPR-Cas in non-mammalian systems part A - 2021-03-28

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

CRISPR-/Cas9 Based Genome Editing for Treating Genetic Disorders and Diseases Luis M. Vaschetto 2021-10

"The field of genome editing has progressed incredibly in the last few years mainly due to the emergence of versatile genome editing tools such as endonuclease-based systems which can be used to efficiently edit gene sequences in a targeted fashion. The CRISPR/Cas9 genome editing system represents an easy-to-use and low-cost alternative for gene editing that has revolutionized research in many different areas ranging from medicine and biotechnology, by democratizing genome editing in laboratories around the world. Remarkably, the CRISPR/Cas9-mediated gene editing system can be used to replace/correct nucleotide mutations associated with genetic disorders and diseases. The objective of this book is to shed light on the CRISPR/Cas9 system and related genome engineering technologies in therapeutics and gene therapy"--

Plant Genome Editing with CRISPR Systems - Yiping Qi 2018

This volume provides readers with wide-ranging coverage of CRISPR systems and their applications in various plant species. The chapters in this book discuss topics such as plant DNA repair and genome editing; analysis of CRISPR-induced mutations; multiplexed CRISPR/Cas9 systems; CRISPR-Cas12a (Cpf1) editing systems; and non-agrobacterium based CRISPR delivery systems. 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 thorough, Plant Genome Editing with CRISPR Systems: Methods and Protocols is a valuable resource for any

researcher interested in learning about and using CRISPR systems in plants.

CRISPR-Cas in Agriculture: Opportunities and Challenges - Sandeep Kumar 2021-05-28

Chromosomal Mutagenesis - Shondra M. Pruett-Miller 2016-09-22

This new edition explores current and emerging mutagenesis methods focusing specifically on mammalian systems and commonly used model organisms through comprehensive coverage and detailed protocols. Since the first edition, major advances and discoveries have made chromosomal mutagenesis a widely used technique and one that is available to any molecular biology laboratory, and this collection provides detailed protocols, case-studies, and reviews from thought-leaders in the field. 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 fully updated, Chromosomal Mutagenesis, Second Edition aims to help speed scientific discovery and aid in the next advances in the field.

Diversity and Evolution of Butterfly Wing Patterns - Toshio Sekimura 2017-08-29

This book facilitates an integrative understanding of the development, genetics and evolution of butterfly wing patterns. To develop a deep and realistic understanding of the diversity and evolution of butterfly wing patterns, it is essential and necessary to approach the problem from various kinds of key research fields such as “evo-devo,” “eco-devo,” ”developmental genetics,” “ecology and adaptation,” “food plants,” and “theoretical modeling.” The past decade-and-a-half has seen a veritable revolution in our understanding of the

development, genetics and evolution of butterfly wing patterns. In addition, studies of how environmental and climatic factors affect the expression of color patterns has led to increasingly deeper understanding of the pervasiveness and underlying mechanisms of phenotypic plasticity. In recognition of the great progress in research on the biology, an international meeting titled “Integrative Approach to Understanding the Diversity of Butterfly Wing Patterns (IABP-2016)” was held at Chubu University, Japan in August 2016. This book consists of selected contributions from the meeting. Authors include main active researchers of new findings of corresponding genes as well as world leaders in both experimental and theoretical approaches to wing color patterns. The book provides excellent case studies for graduate and undergraduate classes in evolution, genetics/genomics, developmental biology, ecology, biochemistry, and also theoretical biology, opening the door to a new era in the integrative approach to the analysis of biological problems. This book is open access under a CC BY 4.0 license.

Reprogramming the Genome: CRISPR-Cas-based Human Disease Therapy - 2021-06-12

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

Heritable Human Genome Editing The Royal Society 2021-01-16

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.

How Genome Editing is Revolutionizing Medicine - Gunnar Keller 2021-12-20 Bachelor Thesis from the year 2020 in the subject Biology - Genetics / Gene Technology, grade: 1,1, Management Center Innsbruck, course: Biotechnology, language: English, abstract: CRISPR continues to drive the world of gene editing. About seven years ago, scientists reported that CRISPR technology can enable precise and efficient genome editing in living eukaryotic cells. Since then, interest in the method has spread extensively across the globe. Not long after its sudden headstart in 2013, already thousands of laboratories started taking up the technique and investors began funding startups to harness its potential. This ultimately resulted in major improvements being made in incredibly short periods of time. Simultaneously, this also initiated and continues to drive an increasing gap between new innovative applications in the field of gene editing and the overall awareness of the general public. Ethical concerns have remained a steady companion of this rise. With myriads of research papers about CRISPR related topics being published every year, trying to stay on top of developments can be a cumbersome task. The goal of this paper is to summarize current practice and research areas that are part of modern gene editing. Following a brief summary of CRISPR basics, used endonucleases and techniques, its impact on the treatment of hereditary diseases, viral infections and

cancer is illustrated based on recent examples. Effects of gene editing on cell line engineering efforts are described using studies focusing on glycosylation, impurities, cultivation and production efficiency issues of CHO cell lines. Besides discussing CRISPR applications for rapid SARS-CoV-2 diagnosis, current challenges for clinical use including off-targets, immune responses and lacking drug delivery efficiencies as well as promising developments are being reviewed. This paper is supposed to support quick elucidation of future potential of the rapidly evolving world of CRISPR Cas genome editing and facilitate retrieval of further literature.

CRISPR-Cas - University Jennifer Doudna 2016-03-23

The development of CRISPR-Cas technology is revolutionizing biology. Based on machinery bacteria use to target foreign nucleic acids, these powerful techniques allow investigators to edit nucleic acids 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.

A Crack In Creation - Jennifer A. Doudna 2017-06-13

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

The CRISPR/Cas System - Muhammad Jamal 2017-04-01

The use of CRISPR/Cas technology for genome editing suggests many potential

applications, including the alteration of the germline of humans, animals and food crops. The speed and efficiency of the CRISPR/Cas system make it a potentially useful system for gene therapy. In this volume expert international authors provide a useful and timely review of the applications of the CRISPR/Cas system across diverse fields and explore further avenues and research directions of this novel and powerful editing technology. The technology and its application are reviewed with respect to reproduction and development, immunity and genetic diseases, system structure and system specificity. Some of the potential problems of the CRISPR/Cas system are also discussed, in particular the specificity of the system: this remains an important topic as improvement could lead to the more direct and efficient use of the CRISPR/Cas system in clinical settings. The authors also debate ethical concerns associated with this powerful new technology. This volume is a rigorous review of the applications and new opportunities for the CRISPR/Cas system and provides a stimulus for current and future research. An invaluable guide for all scientists working in the fields of genome editing and gene therapy the book is also recommended for all life sciences libraries.

Genome Engineering Via CRISPR-Cas9 System - Vijai Singh 2020-02-03

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 in Animals and Animal Models - 2017-11-10

CRISPR in Animals and Animal Models, Volume 152, the latest release in the Progress in Molecular Biology and Translational Science series, explores the genome editing CRISPR system in cells and animal models, its applications, the uses of the CRISPR system, and the past, present and future of CRISPR genome editing. Topics of interest in this updated volume include a section on CRISPR history, The genome editing revolution, Programming CRISPR and its applications, CRISPR Delivery methods, CRISPR libraries and screening, CRISPR investigation in haploid cells, CRISPR in the generation of transgenic animals, CRISPR therapeutics, and Promising strategies and present challenges. Accessible to students and researchers alike Written by leading authorities in the field

Gene Editing - Yuan-Chuan Chen 2019-05-29

Gene-editing technologies (e.g., ZFNs, TALENs, and CRISPRs/Cas9) have been extensively used as tools in basic research. They are

further applied in manufacturing agricultural products, food, industrial products, medicinal products, etc. Particularly, the discovery of medicinal products using gene-editing technologies will open a new era for human therapeutics. Though there are still many technical and ethical challenges ahead of us, more and more products based on gene-editing technologies have been approved for marketing. These technologies are promising for multiple applications. Their development and implications should be explored in the broadest context possible. Future research directions should also be highlighted. In this book, the applications, perspectives, and challenges of gene-editing technologies are significantly demonstrated and discussed.

Genome Editing and Engineering - Krishnarao Appasani 2018-06-30

Recent advances in genome editing tools using endonucleases such as TALENs, ZFNs, and CRISPRs, combined with genomic engineering technologies, have opened up a wide range of opportunities from applications in the basic sciences and disease biology research, to the potential for clinical applications and the development of new diagnostic tools. This complete guide to endonuclease-based genomic engineering gives readers a thorough understanding of this rapidly expanding field. Chapters cover the discovery, basic science, and application of these techniques, focusing particularly on their potential relevance to the treatment of cancer, and cardiovascular and immunological disease. The final section discusses the legal and ethical issues which accompany the technology. Providing authoritative coverage of the potential that genome editing and engineering have, this is an ideal reference for researchers and graduate students and those working in the biotechnology and pharmaceutical industries, as well as in a clinical setting.

Using a Chemically-controlled CRISPR/Cas9 System to Understand and Develop New Genome Engineering Technologies - Cindy Tianxin Wei 2022

Clustered regularly interspaced short palindromic repeat (CRISPR) systems have revolutionized our ability to investigate the genotype-phenotype relationships of specific genetic elements. The class 2 type II CRISPR system, involving a Cas9 endonuclease, has been widely adopted to aid in making specific genomic DNA changes. Precise DNA targeting by the CRISPR/Cas9 system is achieved using an RNA molecule that encodes a 20 nucleotide (nt) sequence complementary to the target site. Cas9 can be targeted to different loci in the genome by simply changing the 20 nt RNA-encoded sequence. Cas9 can then create DNA double-strand breaks (DSBs) at the target site and induce DNA repair to incorporate a specific DNA edit or uncontrolled insertions and deletions to knock out a gene. The CRISPR/Cas9 system has also been adapted to create a precise DNA targeting module that can recruit different DNA effector systems, such as transcriptional activators, DNA deaminases, and histone modifiers. While CRISPR/Cas9 has enabled new insights into genotype-phenotype relationships, challenges remain with the formation of unwanted edits, such as off-target edits or bystander edits with base editor systems. Furthermore, there is a lack of a generalizable method to create temporally-controlled Cas9-based effector systems to allow investigation of temporally-regulated genetic elements. Here, I use a chemically-inducible Cas9 (ciCas9) to explore the in vivo mechanisms of Cas9 off-target editing and to develop a generalizable system to confer temporal control over a variety of Cas9-based effector systems. Using engineered chemically-controlled base editors, I dissected the kinetics of bystander editing and how base editing at one nucleotide

influences subsequent base edits within the same target site. I envision the results presented here could be used to inform future efforts to study temporally-regulated genetic elements and to engineer more efficient and accurate Cas9-based genome engineering systems.

Synthetic Genomics - Miguel Fernández-Niño 2022

CRISPR/Cas Genome Editing- Anjanabha Bhattacharya 2020-12-11

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.

Genome Editing and Engineering- Krishnarao Appasani 2018-08-23

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

The New Microbiology - Pascale Cossart 2020-07-10

Microbiology has undergone radical changes over the past few decades, ushering in an exciting new era in science. In The New Microbiology, Pascale Cossart tells a splendid story about the revolution in microbiology, especially in bacteriology. This story has wide-ranging implications for human health and medicine, agriculture, environmental

science, and our understanding of evolution. The revolution results from the powerful tools of molecular and cellular biology, genomics, and bioinformatics, which have yielded amazing discoveries, from entire genome sequences to video of bacteria invading host cells. This book is for both scientists and especially nonscientists who would like to learn more about the extraordinary world of bacteria. Dr. Cossart's overview of the field of microbiology research, from infectious disease history to the ongoing scientific revolution resulting from CRISPR technologies, is presented in four parts. New concepts in microbiology introduces the world of bacteria and some recent discoveries about how they live, such as the role of regulatory RNAs including riboswitches, the CRISPR defense system, and resistance to antibiotics. Sociomicrobiology: the social lives of bacteria helps us see the new paradigm by which scientists view bacteria as highly social creatures that communicate in many ways, for example in the assemblies that reside in our intestine or in the environment. The biology of infections reviews some of history's worst epidemics and describes current and emerging infectious diseases, the organisms that cause them, and how they produce an infection. Bacteria as tools introduces us to molecules derived from microbes that scientists have harnessed in the service of research and medicine, including the CRISPR/Cas9 genome-editing technology. The New Microbiology takes us on a journey through a remarkable revolution in science that is occurring here and now.

CRISPR-Cas Enzymes - 2019-01-25

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

Genome Editing in Neurosciences - Rudolf Jaenisch 2020-10-08 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.

Genome Engineering for Crop Improvement - Santosh

Kumar Upadhyay 2021-01-19
In recent years, significant advancements have been made in the management of nutritional deficiency using genome engineering—enriching the nutritional properties of agricultural and horticultural crop plants such as wheat, rice, potatoes, grapes, and bananas. To meet the demands of the rapidly growing world population, researchers are developing a range of new genome engineering tools and strategies, from increasing the nutraceuticals in cereals and fruits, to decreasing the anti-nutrients in crop plants to improve the bioavailability of minerals and vitamins. Genome Engineering for Crop Improvement provides an up-to-date view of the use of genome editing for crop bio-fortification, improved bioavailability of minerals and nutrients, and enhanced hypo-allergenicity and hypo-immunogenicity. This volume examines a diversity of important topics including mineral and nutrient localization, metabolic engineering of carotenoids and flavonoids, genome engineering of zero calorie potatoes and allergen-free grains, engineering for stress resistance in crop plants, and more. Helping readers deepen their knowledge of the application of genome engineering in crop improvement, this book: Presents genetic engineering methods for developing edible oil crops, mineral translocation in grains, increased flavonoids in tomatoes, and cereals with enriched iron bioavailability Describes current genome engineering methods and the distribution of nutritional and mineral composition in important crop plants Offers perspectives on emerging technologies and the future of genome engineering in agriculture Genome Engineering for Crop Improvement is an essential resource for academics, scientists, researchers, agriculturalists, and students of plant molecular biology, system biology, plant

biotechnology, and functional genomics.

Targeted Genome Editing Using Site-Specific Nucleases - Takashi Yamamoto 2015-01-05

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.

CRISPR Gene Editing - Yonglun Luo 2019

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.

CRISPR-Cas Systems - Rodolphe Barrangou 2012-12-13

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.

Caenorhibditus Elegans: Modern Biological Analysis of an Organism - 1995-10-16

The first of its kind, this laboratory handbook emphasizes diverse methods and technologies needed to investigate C. elegans, both as an integrated organism and as a model system for research inquiries in cell,developmental, and molecular biology, as well as in genetics and pharmacology. Four primary sections--Genetic and Culture Methods, Neurobiology, Cell and Molecular Biology, and Genomics and Informatics--reflect the cross-disciplinary nature of C. elegans research.

Because C. elegans is a simple and malleable organism with a small genome and few cell types, it provides an elegant demonstration of functions fundamental to multicellular organisms. The discipline has greatly expanded as researchers continue to find this small soil nematode to be the model of choice for studying specific pathways, stages of development, and cell types. By directing its audience not just to tried-and-true recipes for research, but also to databases and other innovative sources of information, this comprehensive collection is intended to guide investigators of C. elegans for years to come. First single-source book detailing explanations of current and classic C. elegans methodologies Diversity and scope of techniques covered expected to be useful to the broadening community of C. elegans researchers for years to come Techniques range from reverse genetics and mutagenesis, to laser ablation and electrophysiology, to in situ hybridization and DNA sequencing methods Appendices include resource information important to the C. elegans community, including the C. elegans Genetics Center and Internet resources like the Worm Community System and ACeDB Illustrated with more than 100 tables and figures

Artificial Nucleases - Marina A. Zenkova 2012-12-06

The development of agents capable of cleaving RNA and DNA has attracted considerable attention from researchers in the last few years, because of the immediate and very important applications they can find in the emerging fields of biotechnology and pharmacology. There are essentially two classes of these agents - nucleases that occur naturally inside cells and synthetically produced artificial nucleases. The first class includes protein enzyme nucle ases and catalytic RNA structured ribozymes that perform cleavage of the phosphodiester bonds in nucleic acids according to a

hydrolytic pathway in the course of different biochemical processes in the cell. A different pathway is used by some antibiotics which cleave DNA via redox-based mechanisms resulting in oxidative damage of nucleotide units and breakage of the DNA backbone. The above molecules are indispensable tools for manipulating nucleic acids and processing RNA; DNA-cleaving antibiotics and cytotoxic ribonucleases have demonstrated utility as chemotherapeutic agents. The second class, artificial nucleases, are rationally designed to imitate the active centers of natural enzymes by simple structures possessing minimal sets of the most important characteristics that are essential for catalysis. A dif ferent approach, in vitro selection, was also used to create artificial RNA and DNA enzymes capable of cleaving RNA. Being less efficient and specific as compared to the natural enzymes, the primitive mimics are smaller and robust and can function in a broad range of conditions.

Advances in CRISPR/Cas and Related Technologies - Dipanjan Ghosh 2021-03-08 Advances in CRISPR/Cas and related technologies, Volume 179, the latest release in this ongoing series, deals with a wide variety of research topics related to recent advancement in the genome editing techniques. Associated chapters in this new release include Challenges for Therapeutic application of CRISPR Cas techniques, Mitochondrial DNA modification by CRISPR Cas System: Challenges and future direction, Trends in CRISPR Cas technology application in cancer, Modified CRISPR-Cas for next generation application, Application of CRISPR Cas in Synthetic Biology: Challenges and Scopes, History of CRISPR Cas system from bacterial Adaptive Immune System to research application, and more. Covers the Cas9 protein modification for reduced off-target effect Includes discussions on Cas9 utilization for Metabolic Engineering

Provides information on the use of Cas9 for targeted delivery in therapeutic application

Reprogramming the Genome: Applications of CRISPR-Cas in Non-mammalian Systems Part B - Vijai Singh 2021-04-30

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

Plant Genome Editing – Policies and Governance - Thorben Sprink 2020-04-22

The CRISPR/Cas Tool Kit for Genome Editing - Aftab Ahmad (Biochemist) 2021

This book discusses

CRISPR/Cas- one of the most powerful tools available to scientists for genome editing. CRISPR/Cas is not only a genome editing tool, but researchers have also engineered it for gene regulation, genome imaging, base editing and epigenome regulations. This book describes the entire toolkit for CRISPR/Cas. The opening section gives an introduction to the technique and compares it with other genome editing tools. Further section gives a historical perspective of the tool, along with its detailed classification. The next chapters describe bioinformatic tools in CRISPR/Cas, and delivery methods for CRISPR/Cas. The book also discusses about the applications of CRISPR/Cas beyond genome editing and use of CRISPR for rewriting genetic codes. The book dedicates a section to the use of CRISPR in plants. The book culminates with a chapter on the current status, challenges and shortcomings of the CRISPR/Cas genome editing tool. The book would be highly interesting to students and researchers in molecular biology, biochemistry, biotechnology, food science, agriculture and plant sciences.