Plant Cell Electroporation And Electrofusion Protocols Methods In Molecular Biology

Omics Technologies and Bio-Engineering: Towards Improving Quality of Life, Volume 2 is a unique reference that brings together multiple perspectives on omics research, providing in-depth analysis and insights from an international team of authors. The book delivers pivotal information that will inform and improve medical and biological research by helping readers gain more direct access to analytic data, an increased understanding on data evaluation, and a comprehensive picture on how to use omics data in molecular biology, biotechnology and human health care. Covers various aspects of biotechnology and bio-engineering using omics technologies Focuses on the latest developments in the field, including biofuel technologies Provides key insights into omics approaches in personalized and precision medicine Provides a complete picture on how one can utilize omics data in molecular biology, biotechnology and human health care

Edited by renowned protein scientist and bestselling author Roger L. Lundblad, with the assistance of Fiona M. Macdonald of CRC Press, this fourth edition of the Handbook of Biochemistry and Molecular Biology represents a dramatic revision – the first in two decades – of one of biochemistry's most referenced works. This edition gathers a wealth of information not easily obtained, including information not found on the web. Offering a molecular perspective not available 20 years ago, it provides physical and chemical data on proteins, nucleic acids, lipids, and carbohydrates. Presented in an organized, concise, and simple-to-use format, this popular reference allows quick access to the most frequently used data. Covering a wide range of topics, from classical biochemistry to proteomics and genomics, it also details the properties of commonly used biochemicals, laboratory solvents, and reagents. Just a small sampling of the wealth of information found inside the handbook: Buffers and buffer solutions Heat capacities and combustion levels Reagents for the chemical modification of proteins Comprehensive classification system for lipids Biological characteristics of vitamins A huge variety of UV data Recommendations for nomenclature and tables in biochemical thermodynamics Guidelines for NMR measurements for determination of high and low pKa values Viscosity and density tables Chemical and physical properties of various commercial plastics Generic source-based nomenclature for polymers Therapeutic enzymes About the Editors: Roger L. Lundblad, Ph.D. Roger L. Lundblad is a native of San Francisco, California. He received his undergraduate education at Pacific Lutheran University and his PhD degree in biochemistry at the University of Washington. After postdoctoral work in the laboratories of Stanford Moore and William Stein at the Rockefeller University, he joined the faculty of the University of North Carolina at Chapel Hill. He joined the Hyland Division of Baxter Healthcare in 1990. Currently Dr. Lundblad is an independent consultant and writer in biotechnology in Chapel Hill, North Carolina. He is an adjunct Professor of Pathology at the University of North Carolina at Chapel Hill and Editor-in-Chief of the Internet Journal of Genomics and Proteomics. Fiona M. Macdonald, Ph.D., F.R.S.C. Fiona M. Macdonald received her BSc in chemistry from Durham University, UK. She obtained her PhD in inorganic biochemistry at Birkbeck College, University of London, studying under Peter Sadler. Having spent most of her career in scientific publishing, she is now at Taylor and Francis and is involved in developing chemical information products.

Electroporation is an efficient method to introduce macromolecules such as DNA into a wide variety of cells. Electrofusion results in the fusion of cells and can be used to produce genetic hybrids or hybridoma cells. Guide to Electroporation and Electrofusion is designed to serve the needs of students, experienced researchers, and newcomers to the field. It is a comprehensive manual that presents, in one source, up-to-date, easy-to-follow protocols necessary for efficient electroporation and electrofusion of bacteria, yeast, and plant and animal cells, as well as background information to help users optimize their results through comprehension of the principles behind these techniques. Key Features * Covers fundamentals of electroporation and electrofusion in detail * Molecular events * Mechanisms * Kinetics * Gives extensive practical information * The latest applications * Controlling parameters to maximize efficiency * Available instrumentation * Presents applications of electroporation and electrofusion in current research situations * State-of-the-art modifications to electrical pulses and generators * Application of electroporation and electrofusion to unique, alternative cell and tissue types * Gives straightforward, detailed, easy-to-follow protocols for * Formation of human hybridomas * Introduction of genetic material into plant cells and pollen * Transfection of mammalian cells * Transformation of bacteria, plants, and yeast * Production of altered embryos * Optimization of electroporation by using reporter genes * Comprehensive and up-to-date * Convenient bench-top format * Approximately 125 illustrations complement the text * Complete references with article titles * Written by leading authorities in electroporation and electrofusion

The present book thus emphasizes the importance of plant protoplasts for fundamental research. This book is intended to be used b senior undergraduates, graduate students, and research scientists in plant biology.

Transgenic Approaches

Volume 5

Somatic Embryogenesis in Woody Plants

Electroporation Protocols for Microorganisms

Plant Tissue Culture Manual

The ability to introduce macromolecules into animal cells, includ ing DNA, RNA, proteins, and other bioactive compounds has facili tated a broad range of biological studies, from biochemistry and biophysics to molecular biology, cell biology, and whole animal stud ies. Gene transfer technology in particular will continue to play an essential role in studies aimed at improving our understanding of the relationships between the gene structure and function, and it has impor tant practical applications in both biotechnology and biomedicine, as evidenced by the current intense interest in gene therapy. Although DNA and other macromolecules may be introduced into cells by a variety of methods, including chemical treatments and microinjection, el- troporation has proven to be simpler to perform, more efficient, and effective with a wider variety of cell types than other techniques. The early and broad success of electric field-mediated DNA transfer soon prompted researchers to investigate electroporation for transferring other types of molecules into cells, including RNA, enzymes, antibodies, and analytic dyes. Animal Cell Electroporation and Electrofusion Protocols begins with three chapters that describe the theoretical and practical aspects of electroporation, including a review of the commercially available instrumentation. These introductory chapters will be of particular inter est to those new to electric field technologies and to those developing protocols for as yet untested species or cell types. Nineteen chapters follow that present well-tested protocols for electroporation of proteins and DNA into insect, fish, and mammalian cells.

Thirty-five chapters on various aspects of fusion of plant protoplasts and somatic hybridization deal with the regeneration of interspecific and intergeneric somatic hybrids and cybrids in various plants: cereals, grasses, legumes, potato, tomato, eggplant, lettuce, Brassica, Datura, Hyoscyamus, Nicotiana, Catharanthus, Rauwolfia, Citrus, Poncirus, Prunus, Pyrus, Populus, algae, bryophytes, and ferns. The implications of somatic hybridization in gene transfer in wide crosses and for the induction of genetic variability in various crops are discussed. The book is an invaluable source of information for advanced students, teachers, and research scientists in the field of plant breeding, genetic engineering, plant tissue culture, and general plant biotechnology.

Methods in Plant Cell Biology provides in two volumes a comprehensive collection of analytical methods essential for researchers and students in the plant sciences. Individual chapters, written by experts in the field, provide an introductory overview, followed by a step-by-step technical description of the methods. This is accompanied by examples of typical results, illustrations, troubleshooting of potential pitfalls, sources of chemicals and equipment, and complete reference lists. Protocols are written to be easily comprehended by beginning research students, but these extensive volumes will also be a valuable addition to the libraries of expert researchers. Key Features * Written by experts, many of whom have developed the individual methods described * Contains most, if not all, the methods needed for modern research in plant cell biology * Up-to-date and comprehensive * Full references * Allows quick access to relevant journal articles and to the sources of chemicals required for the procedures * Selective concentration on higher plant methods allows for particular emphasis on those problems specific to plants

Recently, the electrotechnologies based on the effects of pulsed electric fields (PEF), such as ohmic heating (OH) and DC electric field, have gained real interest in the field of food processing. These techniques efficiently enhance methods of extraction from food plants and dehydration of biosolids. The PEF and pulsed OH techniques preserve the nutritional, functional, structural and sensory properties of products better than conventional extraction technologies. The electrofiltration and electro-osmotic dewatering can be very effective for the separation of bioproducts and dehydration of food wastes. The first source book in the field, this book gives an overview the fundamental principles of electrical techniques, electrophysical properties of foods and agricultural products, application of various emerging electrotechnologies for enhancing the solid-liquid separation and drying processes, extraction techniques of pigments, processing methods of different in-plant tissues and biosolids, electro-osmotic dewatering and electrofiltration of biomaterials, recent industrial- scale gains, and other aspects. Each chapter is complementary to other chapters and addresses the latest efforts in the field.

Comprehensive Biotechnology Second Supplement

Historical Technology Developments

Omics Technologies and Bio-engineering

Electroporation and Electrofusion in Cell Biology

Biological and Medical Aspects of Electromagnetic Fields, Fourth Edition

This collection of practical, cutting-edge techniques for the study of cell signaling provides detailed, step-by-step instructions, helpful notes, and troubleshooting tips that make even the most powerful of the newest techniques readily reproducible. The protocols presented include the use of peptide libraries to study transmembrane signaling; the use of single-cell assays to analyze signal transduction pathways; the reconstitution of signaling complexes; methods for analyzing protein-protein interactions, and more. Introductory reviews explain the basic theory and enable researchers new to the area to rapidly gain understanding, as well as command of the practical knowledge and expertise afforded by the protocols. Transmembrane Signaling Protocols makes available to all researchers the many state-of-the-art techniques that have recently led to landmark discoveries in transmembrane signaling.

During the past 15 years, cellular and molecular approaches have emerged as valuable adjuncts to supplement and complement conventional breeding methods for a wide variety of crop plants. Biotechnology increasingly plays a role in the creation, conservation, characterization and utilization of genetic variability for germplasm enhancement. For instance, anther/microspore culture, somaclonal variation, embryo culture and somatic hybridization are being exploited for obtaining incremental improvement in the existing cultivars. In addition, genes that confer insect- and disease-resistance, abiotic stress tolerance, herbicide tolerance and quality traits have been isolated and re-introduced into otherwise sensitive or susceptible species by a variety of transgenic techniques. Together these transformative methodologies grant access to a greater repertoire of genetic diversity as the gene(s) may come from viruses, bacteria, fungi, insects, animals, human beings, unrelated plants or even be artificially derived. Remarkable achievements have been made in the production, characterization, field evaluation and commercialization of transgenic crop varieties worldwide. Likewise, significant advances have been made towards increasing crop yields, improving nutritional quality, enabling crops to be raised under adverse conditions and developing resistance to pests and diseases for sustaining global food and nutritional security. The overarching purpose of this 3-volume work is to summarize the history of crop improvement from a technological perspective but to do so with a forward outlook on further advancement and adaptability to a changing world. Our carefully chosen “case studies of important plant crops” intend to serve a diverse spectrum of audience looking for the right tools to tackle complicated local and global issues.

This book features a special subsection of Nanomedicine, an application of nanotechnology to achieve breakthroughs in healthcare. It exploits the improved and often novel physical, chemical and biological properties of materials only existent at the nanometer scale. As a consequence of small scale, nanosystems in most cases are efficiently uptaken by cells and appear to act at the intracellular level. Nanotechnology has the potential to improve diagnosis, treatment and follow-up of diseases, and includes targeted drug delivery and regenerative medicine; it creates new tools and methods that impact significantly upon existing conservative practices. This volume is a collection of authoritative reviews. In the introductory section we define the field (intracellular delivery). Then, the fundamental routes of nanodelivery devices, cellular uptake, types of delivery devices, particularly in terms of localized cellular delivery, both for small drug molecules, macromolecular drugs and genes; at the academic and applied levels, are covered. The following section is dedicated to enhancing delivery via special targeting motifs followed by the introduction of different types of intracellular nanodelivery devices (e.g. a brief description of their chemistry) and ways of producing these different devices. Finally, we put special emphasis on particular disease states and on other biomedical applications, whilst diagnostic and sensing issues are also included. Intracellular delivery / therapy is a highly topical which will stir great interest. Intracellular delivery enables much more efficient drug delivery since the impact (on different organelles and sites) is intracellular as the drug is not supplied externally within the blood stream. There is great potential for targeted delivery with improved localized delivery and efficacy.

"Plant transformation technology has played a critical role in advancing biotechnology and fundamental research and evolved as a science. This book describes the breakthrough technologies in all aspects of plant transformation in the last 27 years, which "

Basic Cell Culture Protocols

Plant Protoplasts and Genetic Engineering

Electromanipulation of Cells

Plant Transformation Technologies

Plant Cell Electroporation And Electrofusion Protocols

Electroporation is one of the most widespread techniques used in modem molecular genetics. It is most commonly used to introduce DNA into cells for investigations of gene structure and function, and in this regard, electroporation is both highly versatile, being effective with nearly all species and cell types, and highly efficient. For many cell types, electroporation is either the most efficient or the only means known to effect gene transfer. However, exposure of cells to brief, hi- intensity electric fields has found broad application in other aspects of biological research, and is now routinely used to introduce other types of biological and analytic molecules into cells, to induce cell-cell fusion, and to transfer DNA directly between different species. The first seven chapters of Electroporation Protocols for Micro organisms describe the underlying theory of electroporation, the com mercially available instrumentation, and a number of specialized electroporation applications, such as cDNA library construction and interspecies DNA electrotransfer. Each of the remaining chapters pre sents a well developed method for electrotransformation of a particular bacterial, fungal, or protist species. These chapters also serve to intro duce those new to the field the important research questions that are currently being addressed with particular organisms, highlighting both the major advantages and limitations of each species as a model organ ism, and explaining the roles that electroporation has played in the development of the molecular genetic systems currently in use.

Today it is generally accepted that one of the key areas of biotechnology for the next century will be in plant-based biotechnology. Biotechnology has created new opportunities for plant scientists, with important applications to agriculture and forestry. This reference text is divided into five sections for ease of presentation. The first section focuses on the structure, composition and functionality of plant cells and genes with particular emphasis on the cellular and molecular biology of plants and cultured cells. Section two is concerned with the direct exploitation of cell cultures for the production of useful substances. The third section deals with regeneration and propagation systems. The fourth section considers the increasingly central area of genetic manipulation of plant cell systems. The last section is on specific applications in plant biotechnology. This reference work is a survey of these various facets of plant biotechnology. The individual chapters and the follow-up literature cited allow an easy access to the various subject areas and will, hopefully, stimulate interest in these rapidly moving and exciting fields of research.

We have again brought together for the Third International Symposium on Charge and Field Effects in Biosystems (July 21-27, 1991), a group of scientists whose interests reside in the fields of bioelectrochemistry, bioenergetics, and bioelectric phenomena. Like the previous symposia at the University of Nottingham (1983) and Virginia Commonwealth University (1989) the topics discussed were related to bioelectric phenomena, including solid state theoretical and experimental approaches to charge and energy transfer in biomolecular and cellular systems, ion and electron transport properties of biological and artifical membranes, the effects of electric fields on biological systems, photoinduced bioelectrochemical phenomena, and the applications of bioelectrochemical technology. The present conference also introduced procedures which may well serve to define the mechanisms of various bioelectrical phenomena, including electroporation for gene transfer and electro fusion for hybridoma formation. Favorable comments made during and after the Symposium indicated that a further conference should be held. Tentatively, plans are being considered for 1993 or 1994. Milton 1. Allen Stephen F. Cleary Arthur E. Sowers Donald D. Shillady Acknowledgments The Editors wish to express their thanks to Rinnie O'Connor, Diane Ruff, Rae Gerber, and lody Allen for their assistance in preparing the Symposium volume for publication. Our special thanks also to the reviewers who performed their tasks with enthusiastic promptness.

This book collates the basic and advanced concepts of plant biotechnology and genomics along with the future trends. It discusses the combination of conventional breeding techniques with genomic tools and approaches leading to a new genomics-based plant breeding technology supporting crop plants that respond better to biotic and abiotic stress, and pathogen attacks. Plant genomics play an important role in developing more efficient plant cultivars which are essential for the neo green revolution needed to feed the world's rapidly growing population. Plant genomic data is being utilized in genetic engineering to ensure that better and resilient varieties of crops are available ensuring food security. This book is of immense interest to teachers, researchers, crop scientists, capacity builders, and policy makers. Also, the book serves as additional reading material for undergraduate and graduate students of agriculture, biotechnology, genomics, soil science, and environmental sciences. National and International agricultural scientists and policy makers will also find this to be a useful read.

Capillary Electrophoresis Guidebook

Transmembrane Signaling Protocols

Transgenic Plant Research

Biological and Medical Aspects of Electromagnetic Fields

Volume 2: Towards Improving Quality of Life

This comprehensive collection of recently developed methods for producing new antibody reagents by immunization and recombinant DNA techniques contains ready-to-use protocols that illuminate current areas of research on antibody structure, functions, and applications. The methods can be applied in basic immunological studies involving antibody specificity, catalysis, and evolution, and in the isolation of rare antibodies by phage display technology and the engineering of new antibodies by mutagenesis. They offer insight into new ways of developing clinically useful antibody reagents. Antibody Engineering Protocols constitutes a single-source volume for laboratory investigators who want to minimize extensive literature and methodology searches and to work productively in their fields with reproducible step-by-step protocols.

This manual comprises a range of techniques for research workers in the fields of cell and molecular biology, physiology, plant breeding and propagation, and genetic engineering.

DNA sequencing has become increasingly efficient over the years, resulting in an enormous increase in the amount of data gener ated. In recent years, the focus of sequencing has shifted, from being the endpoint of a project, to being a starting point. This is especially true for such major initiatives as the human genome project, where vast tracts of DNA of unknown function are sequenced. This sheer volume of available data makes advanced computer methods essen tial to analysis, and a familiarity with computers and sequence analy sis software a vital requirement for the researcher involved with DNA sequencing. Even for nonsequencers, a familiarity with sequence analysis software can be important. For instance, gene sequences already present in the databases can be extremely useful in the design of cloning and genetic manipulation experiments. This two-part work on Computer Analysis of Sequence Data is designed to be a practical aid to the researcher who uses computers for the acquisition, storage, or analysis of nucleic acid (and/or pro tein) sequences. Each chapter is written such that a competent scien tist with basic computer literacy can carry out the procedure successfully at the first attempt by simply following the detailed prac tical instructions that have been described by the author. A Notes section, which is included at the end of each chapter, provides advice on overcoming the common problems and pitfalls sometimes encoun tered by users of the sequence analysis software.

Electroporation is an efficient method to introduce macromolecules such as DNA into a wide variety of cells. Electrofusion results in the fusion of cells and can be used to produce genetic hybrids or hybridoma cells. Guide to Electroporation and Electrofusion is designed to serve the needs of students, experienced researchers, and newcomers to the field. It is a comprehensive manual that presents, in one source, up-to-date, easy-to-follow protocols necessary for efficient electroporation and electrofusion of bacteria, yeast, and plant and animal cells, as well as background information to help users optimize their results through comprehension of the principles behind these techniques. Covers fundamentals of electroporation and electrofusion in detail: Molecular events, Mechanisms, Kinetics, Gives extensive practical information, The latest applications, Controlling parameters to maximize efficiency, Available instrumentation Presents applications of electroporation and electrofusion in current research situations State-of-the-art modifications to electrical pulses and generators Application of electroporation and electrofusion to unique, alternative cell and tissue types Gives straightforward, detailed, easy-to-follow protocols for Formation of human hybridomas Introduction of genetic material into plant cells and pollen Transfection of mammalian cells Transformation of bacteria, plants, and yeast Production of altered embryos Optimization of electroporation by using reporter genes Comprehensive and up-to-date Convenient bench-top format Approximately 125 illustrations complement the text Complete references with article titles Written by leading authorities in electroporation and electrofusion

Transgenic Plant Technology for Remediation of Toxic Metals and Metalloids

Plant Genomics for Sustainable Agriculture

Somatic Hybridization in Crop Improvement I

Methods in Plant Cell Biology

Electrotransformation of Bacteria

Updated and more efficient techniques for the culture of animal cells are presented here in a step-by-step format supported by a notes section offering troubleshooting advice with hints and tips developed to guarantee the successful culture of animal cells.

Cells can be funny. Try to grow them with a slightly wrong recipe, and they turn over and die. But hit them with an electric field strong enough to knock over a horse, and they do enough things to justify international meetings, to fill a sizable book, and to lead one to speak of an entirely new technology for cell manipulation. The very improbability of these events not only raises questions about why things happen but also leads to a long list of practical systems in which the application of strong electric fields might enable the merger of cell contents or the introduction of alien but vital material. Inevitably, the basic questions and the practical applications will not keep in step. The questions are intrinsically tough. It is hard enough to analyze the action of the relatively weak fields that rotate or align cells, but it is nearly impossible to predict responses to the cell-shredding bursts of electricity that cause them to fuse or to open up to very large molecular assemblies. Even so, theoretical studies and systematic examination of model systems have produced some creditable results, ideas which should ultimately provide hints of what to try next.

A unique collection of hands-on enzyme assay techniques to study polyamines and their function. The techniques range from assay methods for enzymes of polyamine biosynthesis and catabolism to measurements of polyamines, polyamine transport, and polyamine effects on cell growth. The methods are presented by leading researchers who have perfected them to a high art, and include clear, step-by-step instructions with numerous hints and tips to ensure readily reproducible results.

Gene transfer is an essential technology for improving our under standing of gene structure and function. Although there are many meth ods by which DNA may be introduced into cells—including heat and chemical treatments, and microinjection—electroporation has been found to be the most versatile gene transfer technique. Electroporation is effective with a wide variety of cell types, including those that are difficult to transform by other means. For many cell types, electroporation is either the most efficient or the only means known to effect gene transfer. The early and broad success of electric field-medi ated DNA transfer soon prompted researchers to investigate electroporation for transferring other types of molecules into cells, in cluding RNA, enzymes, antibodies, and analytic dyes. The first section of Plant Cell Electroporation and Electrofusion Protocols includes two chapters that serve as a guide to theoretical and practical aspects of electroporation, and will be of particular interest to those developing protocols for as yet untested species or cell types, and a third chapter that describes commercially available electroporation instruments. The remaining chapters describe well-tested protocols for DNA electrotransfection, electroporation of other biomolecules, or cell electrofusion. These chapters also include brief discussions of alterna tives to electric field-based methods, citing the advantages and limita tions of the various methods for achieving specific goals.

Principles, Operation, and Applications

Plant Protoplasts and Genetic Engineering II

Volume 2

Guide to Electroporation and Electrofusion

Biotechnologies of Crop Improvement, Volume 2

Plant Transformation Technologies is a comprehensive, authoritative book focusing on cutting-edge plant biotechnologies, offering in-depth, forward-looking information on methods for controlled and accurate genetic engineering. In response to ever-increasing pressure for precise and efficient integration of transgenes in plants, many new technologies have been developed. With complete coverage of these technologies, Plant Transformation Technologies provides valuable insight on current and future plant transformation technologies. With twenty-five chapters written by international experts on transformation technologies, the book includes new information on Agrobacterium, targeting transgenes into plant genomes, and new vectors and market systems. Including both review chapters and protocols for transformation, Plant Transformation Technologies is vitally important to graduate students, postdoctoral students, and university and industry researchers.

In this manual, protocols for the transformation of about 40 strains of bacteria are described, with the emphasis placed on the individual critical procedural steps, since the practical details mainly depend on the bacterial strain under investigation. This presentation together with the theoretical introductionary chapters, allows users to modify and adapt each protocol to their own experiments. Bacterial strains with relevance in the food industry, biotechnology, medical and veterinary fields, agroindustry and environmental sciences are covered.

This book is intended to be a working guide to the operation of capillary electrophoresis (CE) instrumentation. Since CE is still a rap idly maturing technique, detailed validated protocols are not widely established. Therefore, extensive experimental procedures are not pro vided for individual analyses. The intention is to provide general guide lines on the principles and practice of CE and to give an overview of the specific technologies and important application areas. Part I provides operating instructions for standard commercially available instruments. Guidelines are included for activities such as changing capillaries, method development, quantitative procedures, optimization of precision and sensitivity, and the validation of meth ods, fraction collection, and troubleshooting, as well as a quick guide to running a separation. The application range of CE is possibly the most diverse of all analytical techniques and ranges from large, complex macromolecules, such as proteins and nucleic acids, to small solutes, such as organic drugs and inorganic anions and cations.

Electrical Manipulation of Cells provides an authoritative and up-to-date review of the field, covering all the major techniques in a single source. The book features broad coverage that ranges from the mechanisms of action of external electrical fields on biological material to the ways in which electrical stimuli are employed to manipulate cells. Bringing together the work of leading international authorities, the book covers membrane breakdown, gene delivery, electroporation, electrostimulation, cell movement, hybridoma production, plant protoplasts, electrorotation and stimulation, and electromagnetic stimulation. For each topic, the authors discuss the relevance of the approach to the current state of the art of biotechnology. Electrical Manipulation of Cells is an unmatched source of information for anyone involved in the manipulation of cells, particularly biotechnologists, cell biology, microbiologists, biophysicists and plant scientists. For researchers, the book provides technical material that ccan be employed in their own work. Students will gain thorough appreciation of the applications of this important technique.

Electrotechnologies for Extraction from Food Plants and Biomaterials

Molecular Breeding for Sustainable Crop Improvement

Electrical Manipulation of Cells

Plant Protoplasts

Polyamine Protocols

Electromanipulation of Cells is the first comprehensive, balanced overview of this dynamic discipline. Edited by leading authorities in the field, the book surveys state-of-the-art research as well as recent practical applications of electric field technologies.

The world population is estimated to reach to more than 10 billion by the year 2050. These projections pose a challenging situation for the agricultural scientists to increase crops productivity to meet the growing food demands. The unavailability and/or inaccessibility to appropriate gene pools with desired traits required to carry out genetic improvement of various crop species make this task formidable for the plant breeders. Incidentally, most of the desired genes reside in the wild genetic relatives of the crop species. Therefore, exploration and characterization of wild genetic resources of important crop species is vital for the efficient utilization of these gene pools for sustainable genetic improvements to assure food security. Further, understanding the myriad complexities of genic and genomic interactions among species, more particularly of wild relatives of crop species and/or phylogenetically distant germplasm, can provide the necessary inputs to increase the effectiveness of genetic improvement through traditional and/or genetic engineering methods. This book provides comprehensive and latest insights on the evolutionary genesis of diversity, access and its utilization in the evolution of various crop species. A comprehensive account of various crops, origin, exploitation of the primary, secondary and tertiary gene pools through breeding, biosystematical, cytogenetical and molecular phylogenetical relationships, and genetic enhancement through biotechnological interventions among others have been provided as the necessary underpinnings to consolidate information on the effective and sustainable utilization of the related genetic resources. The book stresses upon the importance of wild germplasm exploration, characterization and exploitation in the assimilation of important crop species. The book is especially intended for students and scientists working on the genetic improvement of crop species. Plant Breeders, Geneticists, Taxonomists, Molecular Biologists and Plant Biotechnologists working on crop species are going to find this book very useful.

This text is split into four main sections: gene transfer techniques; transgenic approaches to gene isolation; manipulation of plant development, biochemistry and physiology; and predictability of transgene expression.

Leading experts and innovators describe in detail plant cell electroporation and electrofusion techniques for many types of plants. Their protocols cover a diverse set of plant cell types, including different cell types from a single organism (i.e., leaf cells and pollen) and the most important model plants, including maize and tobacco. Each protocol also contains detailed instructions for growth and growth optimization, protoplast generation, and protoplast regeneration for specific plant cell types, along with extensive troubleshooting advice and descriptions of expected results to simplify study design.

Electrical Manipulation Of Cells

Antibody Engineering Protocols

Handbook of Biochemistry and Molecular Biology, Fourth Edition

Supplement 6

Fundamentals and Applications

Biological and Medical Aspects of Electromagnetic Fields examines potential health hazards, exposure standards, and medical applications of electromagnetic (EM) fields. The second volume in the bestselling and newly revisedHandbook of Biological Effects of Electromagnetic Fields, Third Edition, this book draws from the latest studies on the effects of exposure to electric and magnetic fields. In addition to extensive reviews of physiological effects, the book contains now separate reviews of behavioral and cognitive responses to various exposures. The book also describes an approach to setting standards for exposure limits and explores a few of the beneficial uses of EM fields in medical applications, both diagnostics and in treatment. Biological and Medical Aspects of Electromagnetic Fields provides a practical overview of the experiments and methods used to observe ELF and RF fields and the possible useful and hazardous implications of these observations.

The two volumes of this new edition of the Handbook cover the basic biological, medical, physical, and electrical engineering principles. They also include experimental results concerning how electric and magnetic fields affect biological systems—both as potential hazards to health and potential tools for medical treatment and scientific research. They also include material on the relationship between the science and the regulatory processes concerning human exposure to the fields. Like its predecessors, this edition is intended to be useful as a reference book but also for introducing the reader to bioelectromagnetics or some of its aspects. FEATURES • New topics include coverage of electromagnetic effects in the terahertz region, effects on plants, and explicitly applying feedback concepts to the analysis of biological electromagnetic effects • Expanded coverage of electromagnetic brain stimulation, characterization and modeling of epithelial wounds, and recent lab experiments on at all frequencies • Section on background for setting standards and precautionary principle • Discussion of recent epidemiological, laboratory, and theoretical results; including: WHO IARC syntheses of epidemiological results on both high and low frequency fields, IITRI lab study of cancer in mice exposed to cell phone-like radiation, and other RF studies • All chapters updated by internationally acknowledged experts in the field

Transgenic Plant Technology for Remediation of Toxic Metals and Metalloids covers all the technical aspects of gene transfer, from molecular methods, to field performance using a wide range of plants and diverse abiotic stress factors. It describes methodologies that are well established as a key resource for researchers, as well as a tool for training technicians and students. This book is an essential reference for those in the plant sciences, forestry, agriculture, microbiology, environmental biology and plant biotechnology, and those using transgenic plant models in such areas as molecular and cell biology, developmental biology, stress physiology and phytoremediation. Provides in-depth coverage of transgenic plant technology for environmental problems Discusses background and an introduction to techniques and salient protocols using specific plants systems Includes emerging strategies for application of transgenic plans in remediation

The quality of human life has been maintained and enhanced for generations by the use of trees and their products. In recent years, ever rising human population growth has put a tremendous pressure on trees and tree products; growing awareness of the potential of previously unexploited tree resources; and environmental pollution have both accelerated the development of new technologies for tree propagation, breeding and improvement. Biotechnology of trees may be the answer to solve the problems which can not be solved by conventional breeding methods. The combination of biotechnology and conventional methods such as plant propagation and breeding could become a novel approach to improving and multiplying a large number of the trees and woody plants. So far, plant tissue culture technology has largely been exploited by commercial companies in propagation of ornamentals, especially foliage house plants. Generally, tissue culture of woody plants has been recalcitrant. However, limited success has been achieved in tissue culture of angiosperm and gymnosperm woody plants. A number of recent reports on somatic embryogenesis in woody plants such as Norway spruce (Picea abies), Loblolly pine (Pinus taeda), Sandalwood (Santalum album), Citrus and mango (Mangifera indica), offer a ray of hope for inexpensive clonal propagation for large-scale production of plants or 'emblings' or somatic seedlings; protoplast work; cryopreservation; genetic transformation; and synthetic or artificial or manufactured seed production.

Computer Analysis of Sequence Data

Plant Biotechnology

Charge and Field Effects in Biosystems—3

Animal Cell Electroporation and Electrofusion Protocols

Intracellular Delivery