

Free ebook The chloroplast interactions with the environment plant cell monographs [PDF]

the aim of this volume is to merge classical concepts of plant cell biology with the recent findings of molecular studies and real world applications in a form attractive not only to specialists in the realm of fundamental research but also to breeders and plant producers four sections deal with the control of development the control of stress tolerance the control of metabolic activity and novel additions to the toolbox of modern plant cell biology in an exemplary and comprehensive manner and are targeted at a broad professional community it serves as a clear example that a sustainable solution to the problems of food security must be firmly rooted in modern continuously self re evaluating cell biological research no green biotech without green cell biology as advances in modern medicine is based on extensive knowledge of animal molecular cell biology we need to understand the hidden laws of plant cells in order to handle crops vegetables and forest trees we need to exploit not only empirically their astounding developmental physiological and metabolic plasticity which allows plants to cope with environmental challenges and to restore flexible but robust self organisation this volume examines the molecular basis of all aspects of cell division and cytokinesis in plants it features 19 chapters contributed by world experts in the specific research fields providing the most comprehensive and up to date knowledge on cell division control in plants the editors are veterans in the field of plant molecular biology and highly respected worldwide this book discusses central concepts and theories in cell biology from the ancient past to the 21st century based on the premise that understanding the works of scientists like hooke hofmeister caspary strasburger sachs schleiden schwann mendel nemec mcclintock etc in the context of the latest advances in plant cell biology will help provide valuable new insights plants have been an object of study since the roots of the greek chinese and indian cultures since the term cell was first coined by robert hooke 350 years ago in micrographia the study of plant cell biology has moved ahead at a tremendous pace the field of cell biology owes its genesis to physics which through microscopy has been a vital source for piquing scientists interest in the biology of the cell today with the technical advances we have made in the field of optics it is even possible to observe life on a nanoscale from hooke s observations of cells and his inadvertent discovery of the cell wall we have since moved forward to engineering plants with modified cell walls studies on the chloroplast have also gone from julius von sachs experiments with chloroplast to using chloroplast engineering to deliver higher crop yields similarly advances in fluorescent microscopy have made it far easier to observe organelles like chloroplast once studied by sachs or actin observed by bohumiľ nemec if physics in the form of cell biology has been responsible for one half of this historical development biochemistry has surely been the other the study of plant cell expansion involves many different disciplines and technical approaches and this book brings this diversity together to present a multifaceted view of the most up to date knowledge coverage includes data ranging from biophysical measurements and chemical analysis to molecular biological approaches and microscopy since the publication of the first edition of plant microtubules in 2000 our understanding of microtubules and their manifold functions have advanced substantially this revised edition highlights the morphogenetic potential of plant microtubules from three general viewpoints microtubules and morphogenesis microtubules and environment microtubules and evolution the book is an invaluable source of information for researchers as well as for graduate and advanced students while there are a few plant cell biology books that are currently available these are expensive methods oriented monographs the present volume is a textbook for upper undergraduate and beginning graduate students this textbook stresses concepts and is inquiry oriented to this end there is extensive use of original research literature as we live in an era of literature explosion one must be selective these judgements will naturally vary with each investigator input was sought from colleagues in deciding the literature to include in addition to provision of select research literature this volume presents citations and summaries of certain laboratory methods in this connection the textbook stresses quantitative data to enhance the student s analytical abilities thus the volume contains computer spread sheets and references to statistical packages e g harvard graphics and statistica plants are composed of 17 essential and at least 5 beneficial elements and these must be taken up as metal or nutrient ions to allow for growth and cell division much effort has been devoted to studying the physiology and biochemistry of metals and nutrients in plants the aspect of cell biology however is an emerging new field and much needs to be learned about sensing long distance communication within plants and cellular signal transduction chains in response to environmental stress cellular malfunction and consequently disease result when any of the key steps in metal and nutrient homeostasis are disrupted working together leading experts in their respective fields provide a new concept that reaches beyond plant nutrition and plasmalemma transport into cellular physiology each chapter contains basic information on uptake physiological function deficiency and toxicity syndromes long distance and intracellular transport the discussion is devoted to metals and nutrients where recent progress has been made and highlights the aspects of homeostasis and sensing signaling and regulation drawing parallels to other organisms including humans finally the book identifies gaps in our current knowledge and lays out future research directions the endoplasmic reticulum er called the mother of all membranes is spotlighted in this timely new book the work presented here is especially exciting since gfp technology has provided new ways of looking at the dynamics of the er and its relationship to other organelles particularly the golgi apparatus and peroxisomes this book provides in depth knowledge of the er and the diverse roles it plays this book focuses on the plant cytoskeleton and its various cross talks with other cellular components leading to its role in plant growth and development it not only allows the geometric and signaling dimensions of cells but is also very important in

physiological processes the book discusses the recent studies showing the role of actin and microtubule cytoskeleton interactions in cell wall assembly and dynamics the authors examine the role of both microtubules in the mechanics of plant cells and actin filaments in the motility of chloroplasts based on recent advances in the study of the acto myosin complex using high resolution microscopy they propose a new model for intracellular transport in plants exploring an almost forgotten field of bioelectricity in the context of the cytoskeleton the book highlights connections between the dynamic actin filaments and the bioelectricity of membranes and demonstrates that the plant cytoskeleton is involved in the distribution of plant hormones lastly it addresses the role of endomembrane cytoskeleton interactions to show the importance of the cytoskeleton in organelle morphogenesis and cellular functions studies in various plant models have shown how the actin filament and microtubules control and coordinate plant cell growth and development this book summarizes the mechanisms underlying these functions root hairs are tip growing cells that originate from epidermal cells called trichoblasts their role may be simply thought of as extending the surface area of the root to facilitate absorption of nutrients and water however as you will see in this book the root hair is far more than that to an increasingly larger number of plant biologists the root hair is a model cell it grows in much the same way as a pollen tube by sending vast numbers of vesicles containing cell wall precursors to a rounded apical dome the tip once the trichoblast becomes committed to root hair formation it no longer divides the root hair cell has a migrating nucleus and a complex cytoskeleton it has a varied cell wall it is easy to observe through differential interference contrast microscopy because there are no other cells around it to disturb the image cytoplasmic streaming is exceptionally clear and amyloplasts and even mitochondria and endoplasmic reticulum can be seen without reporter labelling in some species root hair mutants are easy to distinguish and catalogue plant hormones are involved in their growth and development it is thus an almost ideal plant cell for experimental manipulation and observation the root hair is also involved in interactions with soil microbes as you will learn from later chapters of the book in a presentation to the Linnean Society of London in November 1831 the Scottish botanist Robert Brown perhaps better known for his discovery of Brownian motion mentioned almost as an afterthought that in orchid epidermal cells a single circular areola could be seen a nucleus of the cell as perhaps it might be termed thus the term nucleus from Latin nucleus or nuculeus little nut or kernel was born for the compartment of the eukaryotic cell that contains the majority of genetic information one hundred and seventy seven years later we know that the nucleus is the site where genetic information is stored in the form of DNA and where it is protected from damage duplicated divided recombined repaired and expressed for the latter the genetic information is faithfully transcribed from DNA to RNA then released from the nucleus into the surrounding cytoplasm most likely translated into polypeptide chains the information re enters the nucleus in the form of diverse proteins that function in the processes listed above in plant cells the plasma membrane is a highly elaborated structure that functions as the point of exchange with adjoining cells cell walls and the external environment transactions at the plasma membrane include uptake of water and essential mineral nutrients gas exchange movement of metabolites transport and perception of signaling molecules and initial responses to external biota selective transporters control the rates and direction of small molecule movement across the membrane barrier and manipulate the turgor that maintains plant form and drives plant cell expansion the plasma membrane provides an environment in which molecular and macromolecular interactions are enhanced by the clustering of proteins in oligomeric complexes for more efficient retention of biosynthetic intermediates and by the anchoring of protein complexes to promote regulatory interactions the coupling of signal perception at the membrane surface with intracellular second messengers also involves transduction across the plasma membrane finally the generation and ordering of the external cell walls involves processes mediated at the plant cell surface by the plasma membrane this volume is divided into three sections the first section describes the basic mechanisms that regulate all plasma membrane functions the second describes plasma membrane transport activity the final section of the book describes signaling interactions at the plasma membrane these topics are given a unique treatment in this volume as the discussions are restricted to the plasma membrane itself as much as possible a more complete knowledge of the plasma membrane's structure and function is essential to current efforts to increase the sustainability of agricultural production of food fiber and fuel crops manipulation of plant architecture is regarded as a new and promising issue in plant biotechnology given the important role of the cytoskeleton during plant growth and development microtubules provide an important target for biotechnological applications aiming to change plant architecture this book introduces some microtubule mediated key processes that are important for plant life and amenable to manipulation by either genetic pharmacological or morphological rationales in the first part the role of microtubules in plant morphogenesis is reviewed the second part covers their role in response to environmental factors the third part deals with the tools that can be used for biotechnological manipulation plant growth is of great economical and intellectual interest plants are the basis of our living environment the production of our food and a myriad of plant based natural products plant biomass is also becoming an important renewable energy resource agricultural plant cultivation and breeding programs have altered plant productivity and yield parameters extensively yet the principles and underlying mechanisms are not well understood at the cellular level growth is the result of only two processes cell division and cell expansion but these two processes are controlled by intertwined signaling cascades and regulatory mechanisms forming complex regulatory networks ultimately this network is what plant scientists are trying to unravel the sequencing of model and agronomically important plant genomes allows complete insight into the molecular components involved in each process methods to quantify the molecular changes image growth processes and reconstruct growth regulatory networks are rapidly developing this knowledge should help to elucidate key regulators and to design methods to engineer plant architecture and growth parameters for future human needs this volume gives a comprehensive overview of what is known about plant growth regulation and growth restraints due to environmental conditions

and should allow readers at all levels an entry into this exiting field of research plants are composed of 17 essential and at least 5 beneficial elements and these must be taken up as metal or nutrient ions to allow for growth and cell division much effort has been devoted to studying the physiology and biochemistry of metals and nutrients in plants the aspect of cell biology however is an emerging new field and much needs to be learned about sensing long distance communication within plants and cellular signal transduction chains in response to environmental stress cellular malfunction and consequently disease result when any of the key steps in metal and nutrient homeostasis are disrupted working together leading experts in their respective fields provide a new concept that reaches beyond plant nutrition and plasmalemma transport into cellular physiology each chapter contains basic information on uptake physiological function deficiency and toxicity syndromes long distance and intracellular transport the discussion is devoted to metals and nutrients where recent progress has been made and highlights the aspects of homeostasis and sensing signaling and regulation drawing parallels to other organisms including humans finally the book identifies gaps in our current knowledge and lays out future research directions a state of the art overview of the intricate functional virus host relationships that allow a virus or viroid to move cell to cell and systemically through the plant as well as from plant to plant and thus to spread infection the book also illustrates the mechanisms by which viruses overcome plant defence responses such as rna silencing arabidopsis is used as an illustration of a plant host eminently suitable for genetic approaches to identify novel players in plant virus interactions this book presents recent advances in the study of nitric oxide no biology biochemistry molecular biology and physiology in plants it provides an overview of current understanding of the no actions involved in adaptive responses of plant fitness to environmental constraints coverage places special emphasis on no dependent signaling molecular adjustments and targets as key elements in plant growth development and stress physiology somatic embryogenesis the initiation of embryos from previously differentiated somatic cells is a unique process in plants this volume expands our view of a subject that is important for plant biotechnology genetics cell biology development and agricultural applications all chapters present the latest research progress including functional genomic genetic and proteomic approaches a special focus is placed on the effects of stress environment and plant growth regulators on embryogenesis the role of genes such as leafy cotyledons and baby boom in defining and maintaining cell competence is discussed endocytosis is a fundamental biological process which is conserved among all eukaryotes it is essential not only for many physiological and signalling processes but also for interactions between eukaryotic cells and pathogens or symbionts this book covers all aspects of endocytosis in both lower and higher plants including basic types of endocytosis endocytic compartments and molecules involved in endocytic internalization and recycling in diverse plant cell types it provides a comparison with endocytosis in animals and yeast and discusses future prospects in this new and rapidly evolving plant research field readers will find an overview of the state of the art methods and techniques applied in plant endocytosis research international series of monographs on pure and applied biology the plant cell wall volume 2 is a four chapter text that covers the botanical aspects of cell wall this book specifically discusses the cell types and cell walls in vascular plants as well as the classification and constitution of cell wall this book deals first with the fractionation biosynthesis components formation regulation and breakdown of cell wall these topics are followed by discussions on cell wall polysaccharides lignin structures cell wall changes during cell growth and the analysis of the wall lysing enzymes other chapters examine the types and chemical components of cell wall carbohydrates and the surface processes in lignin polymer formations a study of the phylogenetic aspects of lignins and lignin synthesis is presented a chapter is devoted to the classification and features of plant species the remaining chapter focuses on the non vascular plants protista and metazoa the book can provide useful information to scientists botanists students and researchers this comprehensive update on plant lipid signaling covers the measurement regulation and function of phospholipases lipid kinases lipid phosphatases inositolpolphosphates polyphosphoinositides phosphatic acid and other lipid signals such as oxylipins plant cell structure and function gene expression and its regulation in plant cells the manipulation of plant cells this monograph on plant cell division provides a detailed overview of the molecular events which commit cells to mitosis or which affect or effect mitosis in 1958 e bunning published a book in the former series proto plasmatologia entitled polaritat und inaquale teilung des pflanzlichen protoplasten polarity and unequal division of the plant protoplast in which for the first time results of experimental plant cytomorphogenesis were re viewed this book was based completely on light microscopic observations and rather simple experimental techniques since then our knowledge of basic cytomorphogenetic mechanisms has greatly increased especially with the introduction of modern ultrastructural biochemical and sophisticated experi mental methods so that the field of cytomorphogenesis in our days should be considered a separate discipline within the general field of cell biology this book cytomorphogenesis in plants represents a necessary attempt to bring together current knowledge in this field of research on a comparable basis unfortunately enormous gaps in our understanding of the underlying principles of cytomorphogenetic events still exist therefore it seemed reason able to present a book composed of individual chapters each written by experts for a defined experimental system each chapter represent a separate treatise with its own references hence it was not possible to avoid some overlap both in the text and in the literature of the chapters without destroying the uni formity of the respective article with today s ever growing economic and ecological problems wood as a raw material takes on increasing significance as the most important renewable source of energy and as industrial feedstock for numerous products its chemical and anatomical structure and the excellent properties that result allow wood to be processed into the most diverse products from logs to furniture and veneers and from wood chippings to wooden composites and paper the aim of this book is to review advances in research on the cellular aspects of cambial growth and wood formation in trees over recent decades the book is divided into two major parts the first part covers the basic process of wood biosynthesis focusing on five major steps that are

involved in this process cell division cell expansion secondary cell wall formation programmed cell death and heartwood formation the second part of the book deals with the regulation of wood formation by endogenous and exogenous factors on the endogenous level the emphasis is placed on two aspects control of wood formation by phytohormones and by molecular mechanisms apart from endogenous factors various exogenous effects such as climate factors are involved in wood formation due to modern microscopic as well as molecular techniques the understanding of wood formation has progressed significantly over the last decade emphasizing the cellular aspects this book first gives an overview of the basic process of wood formation before it focuses on factors involved in the regulation of this process in a presentation to the linnean society of london in november 1831 the scottish botanist robert brown perhaps better known for his discovery of brownian motion mentioned almost as an afterthought that in orchid epidermal cells a single circular areola could be seen a nucleus of the cell as perhaps it might be termed thus the term nucleus from latin nucleus or nuculeus little nut or kernel was born for the compartment of the eukaryotic cell that contains the majority of genetic information one hundred and seventy seven years later we know that the nucleus is the site where genetic information is stored in the form of dna and where it is protected from damage duplicated divided recombined repaired and expressed for the latter the genetic information is faithfully transcribed from dna to rna then released from the nucleus into the surrounding cytoplasm most likely translated into polypeptide chains the information re enters the nucleus in the form of diverse proteins that function in the processes listed above the subject of this book has not been treated comprehensively before for many years i have hesitated to attempt a monographic presentation because i felt uneasy about the idea of delineating something i am not sure about myself and i felt it might be rash to try to integrate what seemed and largely still seems to consist of a heap of tessera not fitting together the conviction won over however that the many details accumulated thus far call for some order now and that an appraisal of where we stand would be appropriate this book i hope can fill a gap barring the way to further progress in the field it is not only a compilation of details but also an attempt to delineate the first outlines of a picture blurry obscure and controversial as it must appear the imagination of the research worker will be aroused i hope and stimulate further progress in addition to data widely dispersed in the literature much unpublished material has been included the limited space available prevented me from giving all the details known the subject is also linked to many neighboring fields of study but these relationships and their ramifications could not be discussed at length this is a minor shortcoming however compared with our great ignorance of the subject in general root hairs the tip growing extensions of root epidermal cells are a model system for answering many plant cell and developmental biology research questions this book written by experts in the field covers the research up to 2008 on cellular genetic electrophysiological and developmental aspects of root hair growth as well as the interaction of root hairs with rhizobia and mycorrhizae in the establishment of symbiosis with a wealth of information on technical and experimental aspects useful in the laboratory this comprehensive book is a valuable resource for researchers and students in the broad field of plant cell and molecular biology this book focuses on the plant cytoskeleton and its various cross talks with other cellular components leading to its role in plant growth and development it not only allows the geometric and signaling dimensions of cells but is also very important in physiological processes the book discusses the recent studies showing the role of actin and microtubule cytoskeleton interactions in cell wall assembly and dynamics the authors examine the role of both microtubules in the mechanics of plant cells and actin filaments in the motility of chloroplasts based on recent advances in the study of the acto myosin complex using high resolution microscopy they propose a new model for intracellular transport in plants exploring an almost forgotten field of bioelectricity in the context of the cytoskeleton the book highlights connections between the dynamic actin filaments and the bioelectricity of membranes and demonstrates that the plant cytoskeleton is involved in the distribution of plant hormones lastly it addresses the role of endomembrane cytoskeleton interactions to show the importance of the cytoskeleton in organelle morphogenesis and cellular functions studies in various plant models have shown how the actin filament and microtubules control and coordinate plant cell growth and development this book summarizes the mechanisms underlying these functions in plant cells the plasma membrane is a highly elaborated structure that functions as the point of exchange with adjoining cells cell walls and the external environment transactions at the plasma membrane include uptake of water and essential mineral nutrients gas exchange movement of metabolites transport and perception of signaling molecules and initial responses to external biota selective transporters control the rates and direction of small molecule movement across the membrane barrier and manipulate the turgor that maintains plant form and drives plant cell expansion the plasma membrane provides an environment in which molecular and macromolecular interactions are enhanced by the clustering of proteins in oligimeric complexes for more efficient retention of biosynthetic intermediates and by the anchoring of protein complexes to promote regulatory interactions 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oxygen stress has grown immensely the oxygen sensor mechanism has been discovered the knowledge about the interaction network of gene expression is expanding and metabolic adaptations have been described in

detail furthermore morphological changes were investigated and the regulative mechanisms triggered by plant hormones or reactive oxygen species have been revealed this book provides a broad overview of all these aspects of low oxygen stress in plants it integrates knowledge from different disciplines such as molecular biology biochemistry ecophysiology and agricultural horticultural sciences to comprehensively describe how plants cope with low oxygen stress and discuss its ecological and agronomical consequences this book is written for plant scientists biochemists and scientists in agriculture and ecophysiology in plant cells the plasma membrane is a highly elaborated structure that functions as the point of exchange with adjoining cells cell walls and the external environment transactions at the plasma membrane include uptake of water and essential mineral nutrients gas exchange movement of metabolites transport and perception of signaling molecules and initial responses to external biota selective transporters control the rates and direction of small molecule movement across the membrane barrier and manipulate the turgor that maintains plant form and drives plant cell expansion the plasma membrane provides an environment in which molecular and macromolecular interactions are enhanced by the clustering of proteins in oligimeric complexes for more efficient retention of biosynthetic intermediates and by the anchoring of protein complexes to promote regulatory interactions the coupling of signal perception at the membrane surface with intracellular second messengers also involves transduction across the plasma membrane finally the generation and ordering of the external cell walls involves processes mediated at the plant cell surface by the plasma membrane this volume is divided into three sections the first section describes the basic mechanisms that regulate all plasma membrane functions the second describes plasma membrane transport activity the final section of the book describes signaling interactions at the plasma membrane these topics are given a unique treatment in this volume as the discussions are restricted to the plasma membrane itself as much as possible a more complete knowledge of the plasma membrane s structure and function is essential to current efforts to increase the sustainability of agricultural production of food fiber and fuel crops root hairs the tip growing extensions of root epidermal cells are a model system for answering many plant cell and developmental biology research questions this book written by experts in the field covers the research up to 2008 on cellular genetic electrophysiological and developmental aspects of root hair growth as well as the interaction of root hairs with rhizobia and mycorrhizae in the establishment of symbiosis with a wealth of information on technical and experimental aspects useful in the laboratory this comprehensive book is a valuable resource for researchers and students in the broad field of plant cell and molecular biology plant parasitic nematodes are among the most destructive plant pathogens causing enormous losses to agronomic crops worldwide this book provides an up to date review of research related to two of the most important nematode pests root knot and cyst nematodes chapters cover early plant nematode interactions identification of nematode proteins important in the establishment of nematode feeding sites and classification of biochemical and signaling pathways significant in the development of specialized feeding sites in the host the cellular and subcellular structures essential for the parasitic interaction are examined by light and electron microscopy modern techniques of gene expression analyses and genomic sequencing are poised to provide an even greater wealth of information to researchers enabling them to develop and examine natural and manmade mechanisms of resistance to this important plant pest the nutritive endosperm of angiosperms is mankind s most important source of food livestock feed and industrial raw material this book is the first comprehensive overview of the developmental and molecular biology of endosperm the text covers cereal endosperm development from fertilization to maturity including molecular and cell biology of the syncytial phase it also goes into the cellularization process and cell fate specification of the embryo surrounding region cells the basal transfer cells the starchy endosperm and aleurone cells

Plant cell monographs 2006

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Applied Plant Cell Biology 2014-01-23

this volume examines the molecular basis of all aspects of cell division and cytokinesis in plants it features 19 chapters contributed by world experts in the specific research fields providing the most comprehensive and up to date knowledge on cell division control in plants the editors are veterans in the field of plant molecular biology and highly respected worldwide

Cell Division Control in Plants 2007-11-23

this book discusses central concepts and theories in cell biology from the ancient past to the 21st century based on the premise that understanding the works of scientists like hooke hofmeister caspary strasburger sachs schleiden schwann mendel nemec mcclintock etc in the context of the latest advances in plant cell biology will help provide valuable new insights plants have been an object of study since the roots of the greek chinese and indian cultures since the term cell was first coined by robert hooke 350 years ago in micrographia the study of plant cell biology has moved ahead at a tremendous pace the field of cell biology owes its genesis to physics which through microscopy has been a vital source for piquing scientists interest in the biology of the cell today with the technical advances we have made in the field of optics it is even possible to observe life on a nanoscale from hooke s observations of cells and his inadvertent discovery of the cell wall we have since moved forward to engineering plants with modified cell walls studies on the chloroplast have also gone from julius von sachs experiments with chloroplast to using chloroplast engineering to deliver higher crop yields similarly advances in fluorescent microscopy have made it far easier to observe organelles like chloroplast once studied by sachs or actin observed by bohumil nemec if physics in the form of cell biology has been responsible for one half of this historical development biochemistry has surely been the other

Concepts in Cell Biology - History and Evolution 2018-03-01

the study of plant cell expansion involves many different disciplines and technical approaches and this book brings this diversity together to present a multifaceted view of the most up to date knowledge coverage includes data ranging from biophysical measurements and chemical analysis to molecular biological approaches and microscopy

The Expanding Cell 2006-11-03

since the publication of the first edition of plant microtubules in 2000 our understanding of microtubules and their manifold functions have advanced substantially this revised edition highlights the morphogenetic potential of plant microtubules from three general viewpoints microtubules and morphogenesis microtubules and environment microtubules and evolution the book is an invaluable source of information for researchers as well as for graduate and advanced students

Plant Microtubules 2008-04-10

while there are a few plant cell biology books that are currently available these are expensive methods oriented monographs the present volume is a textbook for upper undergraduate and beginning graduate students this textbook stresses concepts and is inquiry oriented to this end there is extensive use of original research literature as we live in an era of literature explosion one must be selective these judgements will naturally vary with each investigator input was sought from colleagues in deciding the literature to include in addition to provision of select research literature this volume presents citations and summaries of certain laboratory methods in this connection the textbook stresses quantitative data to enhance the student s analytical abilities thus the volume contains computer spread sheets and references to statistical packages e g harvard graphics and statistica

Plant Cell Biology 2010-03-09

plants are composed of 17 essential and at least 5 beneficial elements and these must be taken up as metal or nutrient ions to allow for growth and cell division much effort has been devoted to studying the physiology and biochemistry of metals and nutrients in plants the aspect of cell biology however is an emerging new field and much needs to be learned about sensing long distance communication within plants and cellular signal transduction chains in response to environmental stress cellular malfunction and consequently disease result when any of the key steps in metal and nutrient homeostasis are disrupted working together leading experts in their respective fields provide a new concept that reaches beyond plant nutrition and plasmalemma transport into cellular physiology each chapter contains basic information on uptake physiological function deficiency and toxicity syndromes long distance and intracellular transport the discussion is devoted to metals and nutrients where recent progress has been made and highlights the aspects of homeostasis and sensing signaling and regulation drawing parallels to other organisms including humans finally the book identifies gaps in our current knowledge and lays out future research directions

Cell Biology of Metals and Nutrients 2010-03-10

the endoplasmic reticulum er called the mother of all membranes is spotlighted in this timely new book the work presented here is especially exciting since gfp technology has provided new ways of looking at the dynamics of the er and its relationship to other organelles particularly the golgi apparatus and peroxisomes this book provides in depth knowledge of the er and the diverse roles it plays

The Plant Endoplasmic Reticulum 2006-08-15

this book focuses on the plant cytoskeleton and its various cross talks with other cellular components leading to its role in plant growth and development it not only allows the geometric and signaling dimensions of cells but is also very important in physiological processes the book discusses the recent studies showing the role of actin and microtubule cytoskeleton interactions in cell wall assembly and dynamics the authors examine the role of both microtubules in the mechanics of plant cells and actin filaments in the motility of chloroplasts based on recent advances in the study of the acto myosin complex using high resolution microscopy they propose a new model for intracellular transport in plants exploring an almost forgotten field of bioelectricity in the context of the cytoskeleton the book highlights connections between the dynamic actin filaments and the bioelectricity of membranes and demonstrates that the plant cytoskeleton is involved in the distribution of plant hormones lastly it addresses the role of endomembrane cytoskeleton interactions to show the importance of the cytoskeleton in organelle morphogenesis and cellular functions studies in various plant models have shown how the actin filament and microtubules control and coordinate plant cell growth and development this book summarizes the mechanisms underlying these functions

The Cytoskeleton 2019-11-30

root hairs are tip growing cells that originate from epidennal cells called trichoblasts their role may be simply thought of as extending the surface area of the root to facilitate absorption of nutrients and water however as you will see in this book the root hair is far more than that to an increasingly larger number of plant biologists the root hair is a model cell it grows in much the same way as a pollen tube by sending vast numbers of vesicles containing cell wall precursors to a rounded apical dome the tip once the trichoblast becomes committed to root hair formation it no longer divides the root hair cell has a migrating nucleus and a complex cytoskeleton it has a varied cell wall it is easy to observe through differential interference contrast microscopy because there are no other cells around it to disturb the image cytoplasmic streaming is exceptionally clear and amyloplasts and even mitochondria and endoplasmic reticulum can be seen without reporter labelling in some species root hair mutants are easy to distinguish and catalogue plant hormones are involved in their growth and development it is thus an almost ideal plant cell for experimental manipulation and observation the root hair is also involved in interactions with soil microbes as you will learn from later chapters of the book

Root Hairs 2012-12-06

in a presentation to the linnean society of london in november 1831 the scottish botanist robert brown perhaps better known for his discovery of brownian motion mentioned almost as an afterthought that in orchid epidermal cells a single circular areola could be seen a nucleus of the cell as perhaps it might be termed thus the term nucleus from latin nucleus or nuculeus little nut or kernel was born for the compartment of the eukaryotic cell that contains the majority of genetic information one hundred and seventy seven years later we know that the nucleus is the site where genetic information is stored in the form of dna and where it is protected from damage duplicated divided recombined repaired and expressed for the latter the genetic information is

faithfully transcribed from dna to rna then released from the nucleus into the surrounding cytoplasm most likely translated into polypeptide chains the information re enters the nucleus in the form of diverse proteins that function in the processes listed above

Functional Organization of the Plant Nucleus 2008-12-16

in plant cells the plasma membrane is a highly elaborated structure that functions as the point of exchange with adjoining cells cell walls and the external environment transactions at the plasma membrane include uptake of water and essential mineral nutrients gas exchange movement of metabolites transport and perception of signaling molecules and initial responses to external biota selective transporters control the rates and direction of small molecule movement across the membrane barrier and manipulate the turgor that maintains plant form and drives plant cell expansion the plasma membrane provides an environment in which molecular and macromolecular interactions are enhanced by the clustering of proteins in oligomeric complexes for more efficient retention of biosynthetic intermediates and by the anchoring of protein complexes to promote regulatory interactions the coupling of signal perception at the membrane surface with intracellular second messengers also involves transduction across the plasma membrane finally the generation and ordering of the external cell walls involves processes mediated at the plant cell surface by the plasma membrane this volume is divided into three sections the first section describes the basic mechanisms that regulate all plasma membrane functions the second describes plasma membrane transport activity the final section of the book describes signaling interactions at the plasma membrane these topics are given a unique treatment in this volume as the discussions are restricted to the plasma membrane itself as much as possible a more complete knowledge of the plasma membrane's structure and function is essential to current efforts to increase the sustainability of agricultural production of food fiber and fuel crops

The Plant Plasma Membrane 2010-11-11

manipulation of plant architecture is regarded as a new and promising issue in plant biotechnology given the important role of the cytoskeleton during plant growth and development microtubules provide an important target for biotechnological applications aiming to change plant architecture this book introduces some microtubule mediated key processes that are important for plant life and amenable to manipulation by either genetic pharmacological or morphological rationales in the first part the role of microtubules in plant morphogenesis is reviewed the second part covers their role in response to environmental factors the third part deals with the tools that can be used for biotechnological manipulation

Plant Microtubules 2000-06-07

plant growth is of great economical and intellectual interest plants are the basis of our living environment the production of our food and a myriad of plant based natural products plant bio mass is also becoming an important renewable energy resource agricultural plant cultivation and breeding programs have altered plant productivity and yield parameters extensively yet the principles and underlying mechanisms are not well understood at the cellular level growth is the result of only two processes cell division and cell expansion but these two processes are controlled by intertwined signaling cascades and regulatory mechanisms forming complex regulatory networks ultimately this network is what plant scientists are trying to unravel the sequencing of model and agronomically important plant genomes allows complete insight into the molecular components involved in each process methods to quantify the molecular changes image growth processes and reconstruct growth regulatory networks are rapidly developing this knowledge should help to elucidate key regulators and to design methods to engineer plant architecture and growth parameters for future human needs this volume gives a comprehensive overview of what is known about plant growth regulation and growth restraints due to environmental conditions and should allow readers at all levels an entry into this exiting field of research

Plant Growth Signaling 2008-05-15

plants are composed of 17 essential and at least 5 beneficial elements and these must be taken up as metal or nutrient ions to allow for growth and cell division much effort has been devoted to studying the physiology and biochemistry of metals and nutrients in plants the aspect of cell biology however is an emerging new field and much needs to be learned about sensing long distance communication within plants and cellular signal transduction chains in response to environmental stress cellular malfunction and consequently disease result when any of the key steps in metal and nutrient homeostasis are disrupted working together leading experts in their respective fields provide a new concept that reaches beyond plant nutrition and plasmalemma transport into cellular physiology each chapter contains basic information on uptake physiological function deficiency and toxicity syndromes long distance and intracellular transport the discussion is devoted to metals and nutrients where recent progress has been made and highlights the aspects of homeostasis and sensing signaling and regulation drawing parallels to

other organisms including humans finally the book identifies gaps in our current knowledge and lays out future research directions

Cell Biology of Metals and Nutrients 2010-03-05

a state of the art overview of the intricate functional virus host relationships that allow a virus or viroid to move cell to cell and systemically through the plant as well as from plant to plant and thus to spread infection the book also illustrates the mechanisms by which viruses overcome plant defence responses such as rna silencing arabidopsis is used as an illustration of a plant host eminently suitable for genetic approaches to identify novel players in plant virus interactions

Viral Transport in Plants 2007-03-24

this book presents recent advances in the study of nitric oxide no biology biochemistry molecular biology and physiology in plants it provides an overview of current understanding of the no actions involved in adaptive responses of plant fitness to environmental constraints coverage places special emphasis on no dependent signaling molecular adjustments and targets as key elements in plant growth development and stress physiology

Nitric Oxide in Plant Growth, Development and Stress Physiology 2007-01-30

somatic embryogenesis the initiation of embryos from previously differentiated somatic cells is a unique process in plants this volume expands our view of a subject that is important for plant biotechnology genetics cell biology development and agricultural applications all chapters present the latest research progress including functional genomic genetic and proteomic approaches a special focus is placed on the effects of stress environment and plant growth regulators on embryogenesis the role of genes such as leafy cotyledons and baby boom in defining and maintaining cell competence is discussed

Somatic Embryogenesis 2006-02-22

endocytosis is a fundamental biological process which is conserved among all eukaryotes it is essential not only for many physiological and signalling processes but also for interactions between eukaryotic cells and pathogens or symbionts this book covers all aspects of endocytosis in both lower and higher plants including basic types of endocytosis endocytic compartments and molecules involved in endocytic internalization and recycling in diverse plant cell types it provides a comparison with endocytosis in animals and yeast and discusses future prospects in this new and rapidly evolving plant research field readers will find an overview of the state of the art methods and techniques applied in plant endocytosis research

Plant Endocytosis 2014-12-03

international series of monographs on pure and applied biology the plant cell wall volume 2 is a four chapter text that covers the botanical aspects of cell wall this book specifically discusses the cell types and cell walls in vascular plants as well as the classification and constitution of cell wall this book deals first with the fractionation biosynthesis components formation regulation and breakdown of cell wall these topics are followed by discussions on cell wall polysaccharides lignin structures cell wall changes during cell growth and the analysis of the wall lysing enzymes other chapters examine the types and chemical components of cell wall carbohydrates and the surface processes in lignin polymer formations a study of the phylogenetic aspects of lignins and lignin synthesis is presented a chapter is devoted to the classification and features of plant species the remaining chapter focuses on the non vascular plants protista and metazoa the book can provide useful information to scientists botanists students and researchers

The Plant Cell Wall 2013-09-11

this comprehensive update on plant lipid signaling covers the measurement regulation and function of phospholipases lipid kinases lipid phosphatases inositolpolphosphates polyphosphoinositides phosphatic acid and other lipid signals such as oxylipins

Lipid Signaling in Plants 2009-12-03

plant cell structure and function gene expression and its regulation in plant cells the manipulation of plant cells

The Molecular Biology of Plant Cells 1977-01-01

this monograph on plant cell division provides a detailed overview of the molecular events which commit cells to mitosis or which affect or effect mitosis

Plant Cell Division 1998

in 1958 e bunning published a book in the former series proto plasmatologia entitled polaritat und inaquale teilung des pflanzlichen protoplasten polarity and unequal division of the plant protoplast in which for the first time results of experimental plant cytomorphogenesis were re viewed this book was based completely on light microscopic observations and rather simple experimental techniques since then our knowledge of basic cytomorphogenetic mechanisms has greatly increased especially with the introduction of modern ultrastructural biochemical and sophisticated experimental methods so that the field of cytomorphogenesis in our days should be considered a separate discipline within the general field of cell biology this book cytomorphogenesis in plants represents a necessary attempt to bring together current knowledge in this field of research on a comparable basis unfortunately enormous gaps in our understanding of the underlying principles of cytomorphogenetic events still exist therefore it seemed reason able to present a book composed of individual chapters each written by experts for a defined experimental system each chapter represent a separate treatise with its own references hence it was not possible to avoid some overlap both in the text and in the literature of the chapters without destroying the uniformity of the respective article

Plant Microtubules 2000

with today s ever growing economic and ecological problems wood as a raw material takes on increasing significance as the most important renewable source of energy and as industrial feedstock for numerous products its chemical and anatomical structure and the excellent properties that result allow wood to be processed into the most diverse products from logs to furniture and veneers and from wood chippings to wooden composites and paper the aim of this book is to review advances in research on the cellular aspects of cambial growth and wood formation in trees over recent decades the book is divided into two major parts the first part covers the basic process of wood biosynthesis focusing on five major steps that are involved in this process cell division cell expansion secondary cell wall formation programmed cell death and heartwood formation the second part of the book deals with the regulation of wood formation by endogenous and exogenous factors on the endogenous level the emphasis is placed on two aspects control of wood formation by phytohormones and by molecular mechanisms apart from endogenous factors various exogenous effects such as climate factors are involved in wood formation due to modern microscopic as well as molecular techniques the understanding of wood formation has progressed significantly over the last decade emphasizing the cellular aspects this book first gives an overview of the basic process of wood formation before it focuses on factors involved in the regulation of this process

Cytomorphogenesis in Plants 2012-12-06

in a presentation to the linnean society of london in november 1831 the scottish botanist robert brown perhaps better known for his discovery of brownian motion mentioned almost as an afterthought that in orchid epidermal cells a single circular areola could be seen a nucleus of the cell as perhaps it might be termed thus the term nucleus from latin nucleus or nuculeus little nut or kernel was born for the compartment of the eukaryotic cell that contains the majority of genetic information one hundred and seventy seven years later we know that the nucleus is the site where genetic information is stored in the form of dna and where it is protected from damage duplicated divided recombined repaired and expressed for the latter the genetic information is faithfully transcribed from dna to rna then released from the nucleus into the surrounding cytoplasm most likely translated into polypeptide chains the information re enters the nucleus in the form of diverse proteins that function in the processes listed above

Plant Tissue and Cell Culture 1973

the subject of this book has not been treated comprehensively before for many years i have hesitated to attempt a monographic presentation because i felt uneasy about the idea of delineating something i am not sure about myself and i felt it might be rash to try to integrate what seemed and largely still seems to consist of a heap of tessera not fitting together the conviction won over however that the many details accumulated thus far call for some order now and that an appraisal of where we stand would be appropriate this book i hope can fill a gap barring the way to further progress in the field it is not only a compilation of details but also an attempt to delineate the first outlines of a picture blurry obscure and controversial as it must appear the imagination of the research worker will be aroused i hope and stimulate further progress in addition to data widely dispersed in the literature

much unpublished material has been included the limited space available prevented me from giving all the details known the subject is also linked to many neighboring fields of study but these relationships and their ramifications could not be discussed at length this is a minor shortcoming however compared with our great ignorance of the subject in general

Cellular Aspects of Wood Formation 2013-04-11

root hairs the tip growing extensions of root epidermal cells are a model system for answering many plant cell and developmental biology research questions this book written by experts in the field covers the research up to 2008 on cellular genetic electrophysiological and developmental aspects of root hair growth as well as the interaction of root hairs with rhizobia and mycorrhizae in the establishment of symbiosis with a wealth of information on technical and experimental aspects useful in the laboratory this comprehensive book is a valuable resource for researchers and students in the broad field of plant cell and molecular biology

Functional Organization of the Plant Nucleus 2009-08-29

this book focuses on the plant cytoskeleton and its various cross talks with other cellular components leading to its role in plant growth and development it not only allows the geometric and signaling dimensions of cells but is also very important in physiological processes the book discusses the recent studies showing the role of actin and microtubule cytoskeleton interactions in cell wall assembly and dynamics the authors examine the role of both microtubules in the mechanics of plant cells and actin filaments in the motility of chloroplasts based on recent advances in the study of the acto myosin complex using high resolution microscopy they propose a new model for intracellular transport in plants exploring an almost forgotten field of bioelectricity in the context of the cytoskeleton the book highlights connections between the dynamic actin filaments and the bioelectricity of membranes and demonstrates that the plant cytoskeleton is involved in the distribution of plant hormones lastly it addresses the role of endomembrane cytoskeleton interactions to show the importance of the cytoskeleton in organelle morphogenesis and cellular functions studies in various plant models have shown how the actin filament and microtubules control and coordinate plant cell growth and development this book summarizes the mechanisms underlying these functions

Patterns of Chloroplast Reproduction 2012-01-10

in plant cells the plasma membrane is a highly elaborated structure that functions as the point of exchange with adjoining cells cell walls and the external environment transactions at the plasma membrane include uptake of water and essential mineral nutrients gas exchange movement of metabolites transport and perception of signaling molecules and initial responses to external biota selective transporters control the rates and direction of small molecule movement across the membrane barrier and manipulate the turgor that maintains plant form and drives plant cell expansion the plasma membrane provides an environment in which molecular and macromolecular interactions are enhanced by the clustering of proteins in oligimeric complexes for more efficient retention of biosynthetic intermediates and by the anchoring of protein complexes to promote regulatory interactions the coupling of signal perception at the membrane surface with intracellular second messengers also involves transduction across the plasma membrane finally the generation and ordering of the external cell walls involves processes mediated at the plant cell surface by the plasma membrane this volume is divided into three sections the first section describes the basic mechanisms that regulate all plasma membrane functions the second describes plasma membrane transport activity the final section of the book describes signaling interactions at the plasma membrane these topics are given a unique treatment in this volume as the discussions are restricted to the plasma membrane itself as much as possible a more complete knowledge of the plasma membrane s structure and function is essential to current efforts to increase the sustainability of agricultural production of food fiber and fuel crops

Root Hairs 2008-12-02

during the last ten years knowledge about the multitude of adaptive responses of plants to low oxygen stress has grown immensely the oxygen sensor mechanism has been discovered the knowledge about the interaction network of gene expression is expanding and metabolic adaptations have been described in detail furthermore morphological changes were investigated and the regulative mechanisms triggered by plant hormones or reactive oxygen species have been revealed this book provides a broad overview of all these aspects of low oxygen stress in plants it integrates knowledge from different disciplines such as molecular biology biochemistry ecophysiology and agricultural horticultural sciences to comprehensively describe how plants cope with low oxygen stress and discuss its ecological and agronomical consequences this book is written for plant scientists biochemists and scientists in agriculture and ecophysiology

The Lytic Compartment of Plant Cells 1975-06-25

in plant cells the plasma membrane is a highly elaborated structure that functions as the point of exchange with adjoining cells cell walls and the external environment transactions at the plasma membrane include uptake of water and essential mineral nutrients gas exchange movement of metabolites transport and perception of signaling molecules and initial responses to external biota selective transporters control the rates and direction of small molecule movement across the membrane barrier and manipulate the turgor that maintains plant form and drives plant cell expansion the plasma membrane provides an environment in which molecular and macromolecular interactions are enhanced by the clustering of proteins in oligimeric complexes for more efficient retention of biosynthetic intermediates and by the anchoring of protein complexes to promote regulatory interactions the coupling of signal perception at the membrane surface with intracellular second messengers also involves transduction across the plasma membrane finally the generation and ordering of the external cell walls involves processes mediated at the plant cell surface by the plasma membrane this volume is divided into three sections the first section describes the basic mechanisms that regulate all plasma membrane functions the second describes plasma membrane transport activity the final section of the book describes signaling interactions at the plasma membrane these topics are given a unique treatment in this volume as the discussions are restricted to the plasma membrane itself as much as possible a more complete knowledge of the plasma membrane s structure and function is essential to current efforts to increase the sustainability of agricultural production of food fiber and fuel crops

The Cytoskeleton 2019

root hairs the tip growing extensions of root epidermal cells are a model system for answering many plant cell and developmental biology research questions this book written by experts in the field covers the research up to 2008 on cellular genetic electrophysiological and developmental aspects of root hair growth as well as the interaction of root hairs with rhizobia and mycorrhizae in the establishment of symbiosis with a wealth of information on technical and experimental aspects useful in the laboratory this comprehensive book is a valuable resource for researchers and students in the broad field of plant cell and molecular biology

The Plant Plasma Membrane 2010-10-02

plant parasitic nematodes are among the most destructive plant pathogens causing enormous losses to agronomic crops worldwide this book provides an up to date review of research related to two of the most important nematode pests root knot and cyst nematodes chapters cover early plant nematode interactions identification of nematode proteins important in the establishment of nematode feeding sites and classification of biochemical and signaling pathways significant in the development of specialized feeding sites in the host the cellular and subcellular structures essential for the parasitic interaction are examined by light and electron microscopy modern techniques of gene expression analyses and genomic sequencing are poised to provide an even greater wealth of information to researchers enabling them to develop and examine natural and manmade mechanisms of resistance to this important plant pest

Low-Oxygen Stress in Plants 2014-01-17

the nutritive endosperm of angiosperms is mankind s most important source of food livestock feed and industrial raw material this book is the first comprehensive overview of the developmental and molecular biology of endosperm the text covers cereal endosperm development from fertilization to maturity including molecular and cell biology of the syncytial phase it also goes into the cellularization process and cell fate specification of the embryo surrounding region cells the basal transfer cells the starchy endosperm and aleurone cells

The Plant Plasma Membrane 2011-07-23

Root Hairs 2010-11-16

Plant Cell Wall 1962-01-01

Cell Biology of Plant Nematode Parasitism 2008-12-18

Endosperm 2007-07-09

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