Cell Division Mitosis And Cytokinesis Tsfx

This special issue of The Enzymes is targeted towards researchers in biochemistry, molecular and cell biology, pharmacology, and cancer. This volume discusses signaling pathways in plants. Contributions from leading authorities Informs and updates on all the latest developments in the field

Cell division is one of the mysterious wonders of life. A great number of cells divide in our body. Thereby a new daughter cell always arises from a mother cell, never from scratch. The actual cell division involves two processes: mitosis (nuclear division) and cytokinesis (cytoplasmic division). DNA is the master instruction set for all that makes cells work. It is in the cell's best interest to duplicate the DNA properly and distribute the new copies to the daughter cells in a highly choreographed and controlled fashion. In Saccharomyces cerevisiae, septin proteins play a key role in coupling mitosis and cytokinesis. The filamentous fungus Aspergillus nidulans does not undergo complete cytokinesis, but needs to coordinate nuclear division with cellular partitioning nevertheless. It has four core septin genes, aspA (an ortholog of S. cerevisiae CDC11), aspB (CDC3), aspC (CDC12), and aspD (CDC10) and one septin gene with no S. cerevisiae ortholog, aspE. We have found that, unlike the other three core septin deletion mutants, the deletion of aspD does not alter the vegetative morphology of A. nidulans, but results in misshaped nuclei, asynchronous nuclear division and mislocalization of nucleolar proteins.

During cell division, chromosome segregation must be coordinated with cell cleavage so that cytokinesis occurs after chromosomes have been safely distributed to each spindle pole. Polo like kinase 1 (Plk1) is an essential kinase that regulates spindle assembly, mitotic entry and chromosome segregation but because of its many mitotic roles it has been difficult to specifically study its post-anaphase functions. Small molecule inhibitors were used to block Plk1 activity at anaphase onset and demonstrate that Plk1 controls both spindle elongation and cytokinesis. Plk1 inhibited cells failed to assemble a contractile ring and contract the cleavage furrow due to a defect in Rho and Rho-GEF localization to the division site. Plk1 inhibition did not affect anaphase A chromosome to pole movement but blocked anaphase B spindle elongation. Anaphase B is thought to result from the coordinated activities of microtubule-sliding motors that drive the poles further apart and changes in spindle microtubule dynamics. Plk1 is unlikely to control anaphase B through regulation of a spindle kinesin because inhibition of known motor proteins failed to recapitulate the Plk1 depletion phenotype. Instead, Plk1 inhibition caused a significant decrease in microtubule growth rate during metaphase and early anaphase, indicating a role for Plk1 in regulating microtubule dynamics. Consistent with an inhibition of microtubule growth rate, Plk1 inhibition reduced the rate of poleward microtubule flux in metaphase spindles and caused a reduction in metaphase spindle length that could be reversed by microtubule stabilization with taxol. These data suggest a model in which Plk1 accelerates microtubule growth during mitosis to maintain spindle length and drive anaphase B spindle elongation.

Many organisms are multicellular, which means they have many cells-even trillions! The cells work together to help the organism do things such as create energy, reproduce, and get rid of waste.

Investigating the Roles of Master Cell Cycle Regulators During Cytokinesis and Embryonic Development in Caenorhabditis Elegans

Chemical Inhibitor Studies of Polo-like Kinase 1 in Late Mitosis and Cytokinesis

Dynamics of Cell Division

Concepts of Biology

Mitosis/Cytokinesis

Biology for AP ® courses covers the scope and sequence requirements of a typical two-semester Advanced Placement ® biology course. The text provides comprehensive coverage of foundational research and core biology concepts through an evolutionary lens. Biology for AP ® Courses was designed to meet and exceed the requirements of the College Board ' s AP ® Biology framework while allowing significant flexibility for instructors. Each section of the book includes an introduction based on the AP ® curriculum and includes rich features that engage students in scientific practice and AP ® test preparation; it also highlights careers and research opportunities in biological sciences.

Please note that the content of this book primarily consists of articles available from Wikipedia or other free sources online. Pages: 39. Chapters: Anaphase, Anaphase-promoting complex, Anaphase lag, Aster (cell biology), Astral microtubules, Aurora inhibitor, Binucleated cells, Cdc14, Cell plate, Chromatid, Chromatin bridge, Cohesin, Condensin, Interphase, Metaphase, Mitogen, Mitotic catastrophe, Mitotic exit, Mitotic index, Mitotic inhibitor, Origin and function of meiosis, Phragmoplast, Phragmosome, Phycoplast, Pole cell, Pom1, Premature chromosome condensation, Preprophase, Preprophase band, Prometaphase, Secondary constriction, Securin, Separase, SMC protein, Spindle apparatus, Telophase. Excerpt: Mitosis is the process by which a cell separates the chromosomes in its cell nucleus into two identical sets, in two separate nuclei. It is a form of karyokinesis, or nuclear division. It is generally followed immediately by cytokinesis, which divides the nuclei, cytoplasm, organelles, and cell membrane into two cells containing roughly equal shares of these cellular components. Mitosis and cytokinesis together define the mitotic (M) phase of the cell cycle-the division of the mother cell into two daughter cells, genetically identical to each other and to their parent cell. This accounts for approximately 10% of the cell cycle. Mitosis occurs only in eukaryotic cells and the process varies in different species. For example, animals undergo an "open" mitosis, where the nuclear envelope breaks down before the chromosomes separate, while fungi such as Aspergillus nidulans and Saccharomyces cerevisiae (yeast) undergo a "closed" mitosis, where chromosomes divide within an intact cell nucleus. Prokaryotic cells, which lack a nucleus, divide by a process called binary fission. The process of mitosis is fast and highly complex. The sequence of events is divided into stages corresponding to the completion of one set of activities and the start of the next. These stages...

Mitosis/Cytokinesis provides a comprehensive discussion of the various aspects of mitosis and cytokinesis, as studied from different points of view by various authors. The book summarizes work at different levels of organization, including phenomenological, molecular, genetic, and structural levels. The book is divided into three sections that cover the premeiotic and premitotic events; mitotic mechanisms and approaches to the study of mitosis; and mechanisms of cytokinesis. The authors used a uniform style in presenting the concepts by including an overview of the field, a main theme, and a conclusion so that a broad range of biologists could understand the concepts. This volume also explores the potential developments in the study of mitosis and cytokinesis, providing a background and perspective into research on mitosis and cytokinesis that will be invaluable to scientists and advanced students in cell biology. The book is an excellent reference for students, lecturers, and research professionals in cell biology, molecular biology, developmental biology, genetics, biochemistry, and physiology.

The Mitosis: Cell Growth & Division Student Learning Guide includes self-directed readings, easy-to-follow illustrated explanations, guiding questions, inquiry-based activities, a lab investigation, key vocabulary review and assessment review questions, along with a post-test. It covers the following standards-aligned concepts: The Cell Cycle; Chromosomes; DNA Replication; Mitosis Overview; Phases of Animal Mitosis; Cytokinesis; Phase of Plant Mitosis; Comparing Plant & Animal Cell Mitosis; and Stem Cells. Aligned to Next Generation Science Standards (NGSS) and other state standards.

Mitosis: Cell Growth & Division Science Learning Guide

Cell Division: Mitosis and Cytokinesis

Anatomy & Physiology

Signaling Pathways in Plants

The Cell: Biochemistry, Physiology, Morphology, Volume III: Meiosis and Mitosis covers chapters on meiosis and mitosis. The book discusses meiosis with regard to the meiotic behavior of chromosomes; the anomalous meiotic behavior in organisms with localized centromeres and in forms with nonlocalized centromeres; and the nature of the synaptic force. The text also describes the mechanism of crossing over; the relationship of chiasmata to crossing over and metaphase pairing; and the reductional versus equational disjunction. The process of mitosis and the physiology of cell division are also considered. The book further tackles the significance of cell division and chromosomes; the essential mitotic plan and its variants; the preparations for mitosis; and the transition period. The text also demonstrates the time course of mitosis; the mobilization of the mitotic apparatus; metakinesis; the metaphase; the mitotic apparatus; anaphase; telophase; cytokinesis; and the physiology of the dividing cell. Physiological reproduction; mitotic rhythms and experimental synchronization; and the blockage and stimulation of division are also encompassed. Biologists, microbiologists, zoologists, and botanists will find the book invaluable.

A version of the OpenStax text

This volume aims to present a large panel of techniques for the study of Plant Cell Division. Plant Cell Division: Methods and Protocols captures basic experimental protocols that are commonly used to study plant cell division processes, as well as more innovative procedures. Chapters are split into five parts covering several different aspect of plant cell division such as, cell cultures for cell division studies, cell cycle progression and mitosis, imaging plant cell division, cell division and morphogenesis, and cytokinesis. Written for the Methods in Molecular Biology series, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and practical, Plant Cell Division: Methods and Protocols is a valuable tool for the study of plant cell division at both the cellular and molecular levels, and in the context of plant development.

Cytokinesis, the latest volume in the Methods in Cell Biology series, looks at the latest advances in cytokinesis. Edited by leaders in the field, this volume presents proven, state-of-art techniques, along with relevant historical background and theory, to aid researchers in efficient design and effective implementation of experimental methodologies. Covers sections on cytokinesis and emerging studies Presents chapters written by experts in the field Includes cutting-edge materials that supplement study

The Septins

Biology for AP ® Courses

Mitosis

Interplay Between Septin AspD, Nuclear Division and the Nucleolus

Centrosomes in Development and Disease

In spite of the fact that the process of meiosis is fundamental to inheritance, surprisingly little is understood about how it actually occurs. There has recently been a flurry of research activity in this area and this volume summarizes the advances coming from this work. All authors are recognized and respected research scientists at the forefront of research in meiosis. Of particular interest is the emphasis in this volume on meiosis in the context of gametogenesis in higher eukaryotic organisms, backed up by chapters on meiotic mechanisms in other model organisms. The focus is on modern molecular and cytological techniques and how these have elucidated fundamental mechanisms of meiosis. Authors provide easy access to the literature for those who want to pursue topics in greater depth, but reviews are comprehensive so that this book may become a standard reference. Key Features * Comprehensive reviews that, taken together, provide up-to-date coverage of a rapidly moving field * Features new and unpublished information * Integrates research in diverse organisms to present an overview of common threads in mechanisms of meiosis * Includes thoughtful consideration of areas for future investigation

All students can learn about mitosis through text written at four different reading levels. Symbols on the pages represent reading-level ranges to help differentiate instruction. Provided comprehension questions complement the text.

Magnifying The Cell Division is a simplest but complete basic book to study and learn the basics of cell division. It is suitable both for layman as well as student beginners of this field. I have added handmade figures in order to more clear the concept. In this book I have tried to cover the basic concepts behind complex system of cell division in order to make readers understand what is meant by Mitosis and Meiosis. School students can be very nicely benefitted from the material present in this book. Hope my effort will be able to benefit as many readers as possible. Suggestions are invited. Thank You! Cee Em

This new volume of Methods in Cell Biology looks at methods for analyzing centrosomes and centrioles. Chapters cover such topics as methods to analyze centrosomes, centriole biogenesis and function in multi-ciliated cells, laser manipulation of centrosomes or CLEM, analysis of centrosomes in human cancers and tissues, proximity interaction techniques to study centrosomes, and genome engineering for creating conditional alleles in human cells. Covers sections on model systems and functional studies, imaging-based approaches and emerging studies Chapters are written by experts in the field Cutting-edge material

All About Mitosis and Meiosis

The Cell Cycle and Cancer

Biology

Control of M-G1 phase-specific expression in fission yeast

Principles of Control

This volume focuses on the structural aspects of cell division - concentrating on both nuclear division (meiosis and mitosis) and cytoplasmic division (cytokinesis). Written as a companion volume to the earlier book in the series - Cell Cycle Control, this book provides an up-to-date account of developments in this exciting area of cell biology.

The Principles of Biology sequence (BI 211, 212 and 213) introduces biology as a scientific discipline for students planning to major in biology and other science disciplines. Laboratories and classroom activities introduce techniques used to study biological processes and provide opportunities for students to develop their ability to conduct research.

In recent years, the study of the plant cell cycle has become of major interest, not only to scientists working on cell division sensu strictu , but also to scientists dealing with plant hormones, development and environmental effects on growth. The book The Plant Cell Cycle is a very timely contribution to this exploding field. Outstanding contributors reviewed, not only knowledge on the most important classes also summarized the various processes in which cell cycle control plays a pivotal role. The central role of the cell cycle makes this book an absolute must for plant molecular biologists.

The Cell Cycle: Principles of Control provides an engaging insight into the process of cell division, bringing to the student a much-needed synthesis of a subject entering a period of unprecedented growth as an understanding of the molecular mechanisms underlying cell division are revealed.

Plant Anatomy

The Eukaryotic Cell Cycle

Maternal Control of Development in Vertebrates

Methods and Protocols

Principles of Biology

The mitotic cell cycle underlies propagation of eukaryotic cells, continually duplicating and dividing. The past few years have seen major advances in understanding of the regulatory mechanisms that impose on the cell cycle to tightly co-ordinate progression through its individual phases, safeguarding the timing and integrity of its hallmark events, DNA synthesis and mitosis. Transcription is prominent among these processes, manifesting its importance for cell cycle controls by the large number of eukaryotic genes that are expressed at specific cell cycle times. Certain genes are cell cycle regulated in a number of organisms, suggesting that their phase-specific transcription is important for all eukaryotic cells. The budding and fission yeasts, Saccharomyces cerevisiae and Schizosaccharomyces pombe, have been used extensively as model organisms for the study of the eukaryotic cell cycle and cell cycle-regulated transcription, because the cell cycle machinery is conserved among eukaryotes and they are experimentally tractable. Recent microarray analyses have shown that cell cycle-specific expression is a frequent theme in the two yeasts, identifying consecutive, inter-dependent, waves of transcriptional activity, coinciding with the four main cell cycle transitions; G1-S, S, G2-M and M-G1 phases. Each phase-specific transcriptional wave corresponds to at least one group of co-regulated genes, sharing common cis- and trans- acting elements. The work presented in this thesis delves into the regulatory network that drives phase-specific gene expression during late mitosis-early G1 phase in fission yeast. During this late cell cycle stage, fission yeast and, indeed, every eukaryotic cell, undergo major changes; each completes mitosis and cytokinesis, partitioning its duplicated genetic and cytoplasmic material into two progeny cells, which then themselves prepare for a new round of mitotic cell division. Consistent with their periodic pattern of expression, most of the genes transcribed during the M-G1 interval in S. pombe encode proteins that execute important functions during late mitosis and cytokinesis. A DNA sequence promoter motif, the PCB (Pombe cell cycle box), has been identified in fission yeast that confers M-G1 specific transcription, and is bound by the PBF (PCB binding factor) transcription factor complex. PCB promoter motifs are present in several M-G1 transcribed genes, including cdc15, spo12, sid2+, fin1+, slp1+, ace2+, mid1+/dmf1+ and plo1+, the latter encoding a Polo-like kinase that also regulates M-G1 gene expression and influences the PCB-dependent binding properties of PBF. Three transcription factors, Sep1p and Fkh2p, both forkhead-like transcription factors, and Mbx1p, a MADS-box protein, have been implicated in M-G1 specific gene expression and are thought to be components of PBF. Consistent with Fkh2p and Sep1p regulating M-G1 specific transcription, forkhead-related sequences are present in the genes' promoters. Notably, fkh2+ contains both PCB and forkhead promoter sequences and is transcribed during the M-G1 interval, implying that Fkh2p and Plo1p regulate gene transcription during late mitosis and ensuing passage through cytokinesis via feedback loops. This study provides further evidence about transcriptional regulation late in the fission yeast cell cycle, revealing that the PCB sequence is crucial for M-G1 specific transcription, with forkhead-associated DNA motifs playing a parallel but smaller regulatory role. Consistent with this hypothesis, work here and elsewhere shows that both Fkh2p and Sep1p control phase-specific expression of their co-regulated genes through the PCB and forkhead sequences. Notably, data in this thesis reveal that these two forkhead transcription factors associate with each other in vitro and in vivo and bind in vivo to the PCB promoter regions of M-G1 transcribed genes, including cdc15+ and plo1+, in a cell cycle specific manner, consistent with Fkh2p repressing and Sep1p activating transcription. Furthermore, Fkh2p contacts its own promoter, suggesting that it regulates its own expression via a negative feedback mechanism. The Plo1p kinase is shown here to bind in vivo to Mbx1p throughout the cell cycle and in a manner that requires both its kinase and polo-box domains. In agreement with this observation, Plo1p can phosphorylate in vitro Mbx1p, itself known to become phosphorylated during late mitosis. This is the first time that a Polo-like kinase has been shown to bind and phosphorylate a MADS-box protein in any organism. Moreover, in concert with Plo1p binding and phosphorylating Mbx1p, ChIP assays here reveal that this kinase interacts in vivo with the PCB promoter DNA of M-G1 expressed genes, including cdc15+ and fkh2+, in a cell cycle-dependent manner with a timing that coincides with low levels of expression, but follows promoter binding by Fkh2p. Given that Plo1p has previously been shown to positively influence M-G1 dependent transcription, its cell cycle pattern of promoter contact suggests that this Polo-like kinase functions at the genes' promoters, most-likely via binding and phosphorylation of Mbx1p, to re-stimulate transcription, following repression by Fkh2p. In parallel, these findings suggest that Plo1p regulates its own expression via a positive feedback loop. Overall, the work presented in this thesis unravels crucial regulatory aspects of the transcriptional network that drives M-G1 specific transcription in S. pombe: it suggests an important role for the PCB promoter motif in transcriptional regulation; it proposes that Fkh2p acts as a repressor while Sep1p as an activator of late mitotic transcription; it reveals and proposes novel functions for Plo1p, a conserved Polo-like kinase family member, involving its association with Mbx1p, a MADS box protein, and its cell cycle specific recruitment to PCB promoters of M-G1 transcribed genes. As transcriptional systems, encompassing homologues of most of the components of this S. pombe M-G1 specific transcriptional network operate both in S. cerevisiae and humans, this demonstrates their importance for mitotic cell cycle progression. Thus this work potentially offers new insights into M-G1 specific gene expression in all eukaryotes.

An inspiring and challenging 20 minute video for high school or university biology students. This video starts by emphasizing the central importance of cells in life, and that living cells can only arise from other living cells by cell division. After distinguishing mitosis (nuclear division) from cytokinesis (cell division), several animal cells are shown undergoing mitosis and a 3D animation shows how the mitotic spindle is assembled. Chromosomes are shown attaching to spindle fibers both in living cells and in a 3D animation. All phases of mitosis are shown and discussed in detail. Cell division in higher plant cells is similarly illustrated, emphasizing the role of the phragmoplast in cell-plate (cross wall) formation. Separation of homologous chromatids and single chromatids is shown in living spermatocytes undergoing meiosis I and II respectively. The relationship between cell division and morphogenesis is introduced by showing several single-celled organisms that differentiate into complex shapes after every division. Other types of cells remain together after division to form simple multicellular organisms. These two abilities are required for embryogenesis. Two examples (in frogs and zebrafish) show how repeated cycles of cell division and differentiation transform the ball of cells created by these divisions into recognizable embryos.

Discovered over a century ago, the centrosome is the major microtubule organizing center of the animal cell. It is a tiny organelle of surprising structural complexity. Over the last few years our understanding of the structure and composition of centrosomes has greatly advanced, and the demonstration of frequent centrosome anomalies in most common human tumors has sparked additional interest in the role of this organelle in a broader scientific community. The centrosome controls the number and distribution of microtubules - a major element of the cell cytoskeleton - and hence influences many important cellular functions and properties. These include cell shape, polarity, and motility, as well as the intracellular transport and positioning of various organelles. Of particular interest, centrosome function is critical for chromosome segregation and cell division. This book is meant to summarize our current knowledge of the structure, function and evolution of microtubule organizing centers, primarily centrosomes. Emphasis is on the role of these organelles in development and disease (particularly cancer).

Intended as a text for upper-division undergraduates, graduate students and as a potential reference, this broad-scoped resource is extensive in its educational appeal by providing a new concept-based organization with end-of-chapter literature references, self-quizzes, and illustration interpretation. The concept-based, pedagogical approach, in contrast to the classic discipline-based approach, was specifically chosen to make the teaching and learning of plant anatomy more accessible for students. In addition, for instructors whose backgrounds may not primarily be plant anatomy, the features noted above are designed to provide sufficient reference material for organization and class presentation. This text is unique in the extensive use of over 1150 high-resolution color micrographs, color diagrams and scanning electron micrographs. Another feature is frequent side-boxes that highlight the relationship of plant anatomy to specialized investigations in plant molecular biology, classical investigations, functional activities, and research in forestry, environmental studies and genetics, as well as other fields. Each of the 19 richly-illustrated chapters has an abstract, a list of keywords, an introduction, a text body consisting of 10 to 20 concept-based sections, and a list of references and additional readings. At the end of each chapter, the instructor and student will find a section-by-section concept review, concept connections, concept assessment (10 multiple-choice questions), and concept applications. Answers to the assessment material are found in an appendix. An index and a glossary with over 700 defined terms complete the volume.

Centrosome and Centriole

The Plant Cell Cycle

Cell Growth and Cell Division

Cell Division Control in Plants

Magnifying The Cell Division

"The authors represent most of the key figures and the work and the book as a whole is an essential reference for the newcomer or specialist in this area and for any student of eukaryotic cell structure and function. This is an important and wonderful reference." –Microbiology Today, May 2009 Septins are an evolutionarily conserved group of GTP-binding and filament-forming proteins that were originally discovered in yeast. Once the preserve of a small band of yeast biologists, the field has grown rapidly in the past few years and now encompasses the whole of animal and fungal biology. Furthermore, septins are nowadays recognized to be involved in a variety of disease processes from neoplasia to neurodegenerative conditions. This book comprehensively examines the septin gene family and their proteins, providing those new to this research area with a detailed and wide ranging introduction to septin biology. It starts with a unique historical perspective on the development of the field, from its beginnings in the screen for cell division mutants by the Nobel Laureate Lee Hartwell. The evolution of the septin gene family then forms a basis for consideration of the biochemistry and functions of septins in yeast and other model organisms including C. elegans and Drosophila. A major part of the book considers the diversity of septins in mammals, their functions and properties as well as their involvement in normal and abnormal cellular states, followed by a speculative overview from the editors of the key questions in septin research and of where the field may be headed. In addition, several appendices summarise important information for those in, or just entering, the field, e.g. nomenclature and septin and septin-like sequences. This book is an essential source of reference material for researchers in septin biology, cell biology, genetics and medicine, in particular pathology, including areas of neurobiology, oncology, infectious disease and developmental biology.

Faithful cell division is required to maintain ploidy and generate daughter cells with necessary genetic components for life. During mitosis, dividing cells face the challenge of coordinating multiple processes to ensure that nascent daughter cells inherit an exact copy of the parent cell's genetic identity to maintain viability. To ensure the proper execution of cell division, multiple core cell cycle proteins, such as Aurora B kinase and separase, are involved in regulating chromosome segregation, cytokinesis and abscission. Interestingly, fundamental roles for these core cell cycle proteins are being characterized in this coordination. Separase regulates chromosome segregation and vesicle trafficking during meiotic and mitotic divisions. Aurora B kinase is well characterized to eliminate incorrect attachments of kinetochore with centromere through its phosphorylation. These faultless attachments initiate a series of signaling pathways to activate separase and promote chromosome segregation. Additionally, Aurora B kinase also phosphorylates centralspindlin to complete cytokinesis and midbody formation. The collection of work presented here addresses the role of these two master cell cycle regulators in cytokinesis, abscission, and cellular events during later morphogenesis. Chapter I outlines the contribution of separase to cytokinesis, highlight how the protease activity of separase regulates exocytosis in anaphase, and suggesting that an unknown substrate is involved in separase's regulation of exocytosis. Chapter II elucidates how programmed cytokinesis in different tissues contributes to later cellular events during morphogenesis and uncovers the novel migration pattern of midbody to apical surface. Finally, in Chapter III, we present several live imaging methods for observing C. elegans embryogenesis which were applied for this study. Collectively, the work presented here addresses the roles of these master cell cycle regulators in exocytosis, cytokinesis, abscission, and later developmental events, which is critical to understand how failure of cell division promote tumorigenesis and aneuploidy. Finally, our study may provide insightful ideas to generate clinical technologies to cure human infertility, cancer and other genetic diseases.

Eggs of all animals contain mRNAs and proteins that are supplied to or deposited in the egg as it develops during oogenesis. These maternal gene products regulate all aspects of oocyte development, and an embryo fully relies on these maternal gene products for all aspects of its early development, including fertilization, transitions between meiotic and mitotic cell cycles, and activation of its own genome. Given the diverse processes required to produce a developmentally competent egg and embryo, it is not surprising that maternal gene products are not only essential for normal embryonic development but also for fertility. This review provides an overview of fundamental aspects of oocyte and early embryonic development and the interference and genetic approaches that have provided access to maternally regulated aspects of vertebrate development. Some of the pathways and molecules highlighted in this review, in particular, Bmps, Wnts, small GTPases, cytoskeletal components, and cell cycle regulators, are well known and are essential regulators of multiple aspects of animal development, including oogenesis, early embryogenesis, organogenesis, and reproductive fitness of the adult animal. Specific examples of developmental processes under maternal control and the essential proteins will be explored in each chapter, and where known conserved aspects or divergent roles for these maternal regulators of early vertebrate development will be discussed throughout this review. Table of Contents: Introduction / Oogenesis: From Germline Stem Cells to Germline Cysts / Oocyte Polarity and the Embryonic Axes: The Balbiani Body, an Ancient Oocyte Asymmetry / Preparing Developmentally Competent Eggs / Egg Activation / Blocking Polyspermy / Cleavage/ Mitosis: Going Multicellular / Maternal-Zygotic Transition / Reprogramming: Epigenetic Modifications and Zygotic Genome Activation / Dorsal-Ventral Axis Formation before Zygotic Genome Activation in Zebrafish and Frogs / Maternal TGF- and the Dorsal-Ventral Embryonic Axis / Maternal Control After Zygotic Genome Activation / Compensation by Stable Maternal Proteins / Maternal Contributions to Germline Establishment or Maintenance / Perspective / Acknowledgments / References"

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

Biology 211, 212, and 213

Biochemistry, Physiology, Morphology

Cells: Molecules and Mechanisms

The Cell Cycle

Molecular Biology of the Cell

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 Growth and Cell Division is a collection of papers dealing with the biochemical and cytological aspects of cell development and changes in bacterial, plant, and animal systems. One paper discusses studies on the nuclear and cytoplasmic growth of ten different strains of the genus Blepharisma, in which different types of nutrition at high and low temperatures alter the species to the extent that they became morphologically indistinguishable. The paper describes the onset of death at high and low temperatures as being preceded by a decrease in the size of the cytoplasm and a corresponding decrease in the size of the macronucleus. The moribund organisms, still possessing structure, are motionless with no distinguishable macronuclear materials. Another paper presents the response of meiotic and mitotic cells to azaguanine, chloramphenicol, ethionine, and 5-methyltryptophan. The paper describes the failure of spindle action, arrest of second division, inhibition of cytokinesis, aberrant wall synthesis, and alterations in chromosome morphology in meiosis cells. In the case of mitosis, a single enzyme—thymidine phosphorylase—shows that reagents which inhibit protein synthesis also inhibit the appearance of that enzyme if the reagent is applied one day before it normally appears. Other papers discuss control mechanisms for chromosome reproduction in the cell cycle, as well as the force of cleavage of the dividing sea urchin egg. The collection can prove valuable for bio-chemists, cellular biologists, micro-biologists, and developmental biologists.

This book provides an overview of the stages of the eukaryotic cell cycle, concentrating specifically on cell division for development and maintenance of the human body. It focusses especially on regulatory mechnisms and in some instances on the consequences of malfunction.

This book traces the history of the major ideas and gives an account of our current knowledge of cytokinesis.

Cytokinesis

Meiosis and Gametogenesis

The Cell in Mitosis

A Concept-Based Approach to the Structure of Seed Plants

Cytokinesis in Animal Cells

The Cell in Mitosis is a collection of papers presented at the First Annual Symposium held on November 6-8, 1961 under the provisions of The Wayne State Fund Research Recognition Award. Contributors focus on the complexities posed by the cell in division and consider topics such as the chemical prerequisites for cell division, the role of the centriole in division cycles, development of the cleavage furrow, chemical aspects of the isolated mitotic apparatus, histone variability, and actin polymerization. This volume is organized into 11 chapters and begins with an overview of cell division, with reference to the basic essential mechanisms of mitogeneses underlying the emergence of the elegant geometries of mitosis. An account of the congression of chromosomes onto metaphase configuration and progression through telophase is also given. The next chapters explore the identity and role of the centriole in the whole life cycle of cell behavior; the fine structure of animal cells during cytokinesis; the mechanism of saltatory particle movements during mitosis; and how chemical and physical agents disrupt the mitotic cycle. A chapter is devoted to the holotrichous ciliate, Tetrahymena pyriformis, paying attention to its fine structure during mitosis. This book will be of interest to physiologists, electron microscopists, light microscopists, biochemists, and others who want to know more about the various aspects of cell division.

Molecular Biology of the CellCell Division: Mitosis and Cytokinesis

Chromosomes and Reproduction: Resources for Chapter 6

Regulation of the Key Mitotic Checkpoint Protein Dma1 Through Post-translational Modifications

My Mother Made Me Do It!

Leveled Texts: Mitosis

Plant Cell Division