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Modeling and Control in the Biomedical Sciences Governing Behavior An Introduction to Optimal Control Problems in Life Sciences and Economics Experimental Design for the Life Sciences Profession of Conscience Data Assimilation and Control: Theory and Applications in Life Sciences Disease Control in Crops Exploring the living universe Out Of Control The Literature of the Life Sciences Feedback Control in Systems Biology Conservation Biological Control Master Control Genes in Development and Evolution Design, Operation, and Control of Insect-Rearing Systems Leadership in the Life Sciences Dual Use Research of Concern in the Life Sciences Mathematics and the Life Sciences Optimal Control Applied to Biological Models High-School Biology Today and Tomorrow Biological Resource Centers Introducing Biological Energetics NMR in the Life Sciences The Science of Life Semi-active Suspension Control Issues in Biological and Life Sciences Research: 2013 Edition Issues in Life Sciences—Bacteriology, Parasitology, and Virology: 2013 Edition A Web of Prevention Life Sciences and Related Fields A Systems Theoretic Approach to Systems and Synthetic Biology II: Analysis and Design of Cellular Systems Mechanisms of Protein Synthesis Radiation and Cellular Control Processes Life Sciences and Related Fields Control Systems Design of Bio-Robotics and Bio-Mechatronics with Advanced Applications Childbirth: Reproductive science, genetics, and birth control Genetic Control of Malaria and Dengue Disciplining Reproduction A Cybernetic View of Biological Growth Adaptive Internal Model Control Cardio-Respiratory Control in Vertebrates Membranes for Life Sciences

Biology is where many of science's most exciting and relevant advances are taking place. Yet, many students leave school without having learned basic biology principles, and few are excited enough to continue in the sciences. Why is biology education failing? How can reform be accomplished? This book presents information and expert views from curriculum developers, teachers, and others, offering suggestions about major issues in biology education: what should we teach in biology and how should it be taught? How can we measure results? How should teachers be educated and certified? What obstacles are blocking reform? This volume contains the papers presented at the international symposium on "Molecular Mechanisms in Protein Synthesis" held on September 26-27, 1983 at the Beyaz Ko§k in Emirgan, Bosphorus, Istanbul. The symposium aimed to create a medium for information exchange and discussions regarding the current developments in the area of protein syn thesis. To ensure an informal yet scientifically stimulating and productive atmosphere providing opportunity for relaxed and speculative discussions, the number of presentations was limited to twenty and that of attendants to about sixty. The emphasis in the symposium was laid on structure-function relations in the prokaryotic protein synthesizing systems and on the control mechanisms of eukaryotic protein synthesis, in particular, during chain initia tion. Other issues like evolutionary aspects of protein synthesis, translational components genes and proofreading were covered as well. The manuscripts represent the extended accounts of the oral presenta tions, and it has been aimed with the concluding remarks at the end of the volume to give a summarizing view of the presentations and the discussions. Hopefully, this book will be taken off of the shelf frequently to be studied carefully over many years. More than 40 researchers were involved in this project, which examines respiration, circulation, and metabolism from ?sh to the land vertebrates, including human beings. A breathable and stable atmosphere ?rst appeared about 500 million years ago. Oxygen levels are not stable in aquatic environments and exclusively water-breathing ?sh must still cope with the ever-changing levels of O 2 and with large temperature changes. This is re?ected in their sophisticated count-current systems, with high O extraction and internal and external O receptors. 2 2 The conquest for the terrestrial environment took place in the late Devonian period (355–359 million years ago), and recent discoveries portray the gradual transitional evolution of land vertebrates. The oxygen-rich and relatively stable atmospheric conditionsimpliedthatoxygen-sensingmechanismswererelativelysimpleandl- gain compared with acid–base regulation. Recently, physiology has expanded into related ?elds such as biochemistry, molecular biology, morphology and anatomy. In the light of the work in these ?elds, the introduction of DNA-based cladograms, which can be used to evaluate the likelihood of land vertebrates and lung?sh as a sister group, could explain why their cardio-respiratory control systems are similar. The diffusing capacity of a duck lung is 40 times higher than that of a toad or lung?sh. Certainly, some animals have evolved to rich high-performance levels. The healthcare professionals who save and extend our lives are helpless without the medicines and technologies that have revolutionised medical care. But the industry that invents, makes and provides these indispensable tools is transforming under the pressure

of ageing populations, globalisation and revolutions in biological and information technology. How this industry adapts and evolves is vitally important to every one of us. This book looks inside the heads and hearts of the people who lead the global pharmaceutical and medical technology industry. It describes how they make sense of their markets and the wider life sciences economy. It reveals what they have learned about how to lead large, complex organisations to compete in dynamic, global markets. Leadership in the Life Sciences is essential reading for anyone working in or with the pharmaceutical and medical technology industry and its halo of supporting companies. Written as ten succinct lessons, it gives the reader unique insight into what the industry's leaders are thinking. Covering topics from leadership to organisational culture, from change management to digital disruption and from competitive strategy to value-creation, each chapter distils the accumulated wisdom of those who lead the complex and turbulent life sciences industry. Control Systems Design of Bio-Robotics and Bio-Mechatronics with Advanced Applications delivers essential and advanced bioengineering information on the application of control and robotics technologies in the life sciences. Judging by what we have witnessed so far, this exciting field of control systems and robotics in bioengineering is likely to produce revolutionary breakthroughs over the next decade. While this book is intended for senior undergraduate or graduate students in both control engineering and biomedical engineering programs, it will also appeal to medical researchers and practitioners who want to enhance their quantitative understanding of physiological processes. Web of Prevention provides a timely contribution to the current debate about life science research and its implications for security. It is an informative guide for both experts and the public. It is a forward-looking contribution covering both ends of the equation and creates momentum for the current discussion on effective preventive measures and effective control measures. While there are no guarantees for preventing misuse, there are nonetheless crucial steps the world community can take towards the overarching goal of a global network for the life sciences. This book sheds light on concrete steps toward the achievement of this worthy goal. "This book with its collection of essays provides an in-depth analysis of the various mutually reinforcing elements that together create and strengthen a web of prevention - or of assurance - that is vital to ensure that the advances in the life sciences are not misused to cause harm. All those engaged in the life sciences and in policy making in governments around the world should read this book so they can take steps to strengthen the web preventing biological weapons". From the Foreword by Dr Gabriele Kraatz-Wadsack, Chief, Weapons of Mass Destruction Branch, Office for Disarmament Affairs, United Nations. "Since September 11, 2001 in many countries renewed attention has been given to how research in the life sciences might inadvertently or intentionally facilitate the development of biological or chemical weapons. This state-of-the-art volume examines the full extent of the issues and debates. Coverage includes an overview of recent scientific achievements in virology, microbiology, immunology and genetic engineering with a view to asking how they might facilitate the production of weapons of mass destruction by state, sub-state or terrorist organizations. Consideration is given to what we have and haven't learned from the past. Employing both academic analysis and reflections by practitioners, the book examines the security-inspired governance regimes for the life sciences that are under development. Ultimately the authors examine what is required to form a comprehensive and workable web of prevention and highlight the importance of encouraging discussions between scientists, policy makers and others regarding the governance of vital but potentially dangerous research". Dr Graham S. Pearson, Visiting Professor of International Security, University of Bradford, UK and previously Director-General, Chemical and Biological Defence Establishment, UK Examining artificial membranes in terms of biocompatibility, drug delivery and controlled release, this book illustrates how existing membrane technologies are being exploited and advanced in emerging medical applications. This work, edited by internationally recognized experts, has author contributions from prominent members of this field who discuss details of all aspects of this technology. This volume provides broad, yet detailed information on synthetic membranes and their applications, including dialysis and artificial kidneys, gas exchange, artificial lungs, devices to assist liver function, and membrane affinity chromatography. What happens to a profession that loses the memory of its moral independence? And what happens then to those reliant on its honor, its advocacy, its initiative? In an era of biotechnological adventure, medical audacity, ecological disruption, fiscal strain, and financial temptation, these are urgent questions for all life scientists and for all they serve. Profession of Conscience is an exposition, analysis, and application of a political-ethical tradition in, of, and for the life sciences, from molecular genetics to clinical medicine to environmental biology. Sprinkle's goal is avoidance of the fate of physics - the previous "super science" - whose technological transformations several generations ago so enhanced its political and economic value to governments, societies, and corporations that it lost control of its own conduct. He discovers within the life sciences a long-evolving profession-specific standard for political action and activism, tracing it from conception in Hellenic and Roman imperial times, through birth and baptism in the Scientific Revolution, then through a naively optimistic adolescence in the nineteenth and early twentieth centuries, and finally into a self-conscious maturity, solemnized at the Nuremberg Trials but tested ever more subtly since, even down to the present day. The protagonist of this book is a set of ideas. The product is "life-sciences liberalism." Out of Control is a summary of what we know about self-sustaining systems, both living ones such as a tropical wetland, or an artificial one, such as a computer simulation of

our planet. The last chapter of the book, "The Nine Laws of God," is a distillation of the nine common principles that all life-like systems share This NATO Double Jump Program, held at Erice, Italy, on NMR in the Life Sciences was supported in part by contributions from Oxford Research Sys tems, Philips International, Technicare Corporation, Varian Instruments, Sciemens Medical, and ESA Control. This program brought together three major research activities in biomedical applications of NMR: high resolu tion NMR studies of proteins and nucleic acids, in vivo studies of animals, and NMR imaging. Whereas in the development of in vivo NMR and NMR imaging the major technological advances came initially from high resolution NMR spectroscopy, this is no longer the situation. The importance of in vivo NMR and NMR imaging in biomedical science and medical diagnosis haS-resulted in an explosion of growth in these areas involving schools of medicine, hos pitals and instrument manufacturers. Major advances in NMR technology now come from biomedical applications of NMR as well as from high resolution NMR. Applications of high resolution NMR to the solutions structures of pro teins and nucleic acids have been revolutionized by the development of two dimensional NMR Fourier transform techniques and the techniques of biotech nology. Now it is possible, with small proteins up to 10,000-12,000 daltons, by 2D FT NMR techniques to follow the path of the polypeptide back bone through the molecule. The combination of 2D FT NMR techniques with genetically engineered proteins provides one of the most powerful approaches to understanding the principles of protein folding, protein stucture and enzyme catalysis. From simple reflexes to complex movements, all animal behavior is governed by a nervous system. But what kind of government is it—a dictatorship or a democracy? Ari Berkowitz explains the variety of structures and strategies that control behavior, while providing an overview of thought-provoking debates and cutting-edge research. Proceedings of a Conference at the Strahlenzentrum der Justus-Liebig-Universität, Gießen, Germany, October 6-10, 1975. Organized in cooperation with Dt. Ges. f. Biophysik. Cospons. by the Comm. of the Europ. Communities, DirectorateGeneral Research, Science and Education, Biology Div. The potential misuse of advances in life sciences research is raising concerns about national security threats. Dual Use Research of Concern in the Life Sciences: Current Issues and Controversies examines the U.S. strategy for reducing biosecurity risks in life sciences research and considers mechanisms that would allow researchers to manage the dissemination of the results of research while mitigating the potential for harm to national security. Biological resource centers (BRCs) collect, certify, and distribute organisms for use in research and in the development of commercial products in the pharmaceutical, agricultural, and biotechnology industries. They maintain a large and varied collection, including cell lines, micro-organisms, recombinant DNA material, biological media and reagents, and the information technology tools that allow researchers to access biological materials. BRCs have established themselves as a crucial element in the life science innovation infrastructure, from their early impact on virology, to their crucial role in addressing cross-culture contamination in the 1970s, to their current leadership in promoting a global biodiversity network. Today they confront new challenges, resulting from shifts in the nature of biological research, the interaction between public and private researchers, and the increasing focus on biosecurity. This book provides a systematic economic assessment of the impact of biological resource centers through their role in facilitating cumulative knowledge in the life sciences and building on their roles as knowledge hubs—institutions that facilitate the transfer of scientific and technical knowledge among members of a research community. The knowledge hubs framework offers insight into how to develop and evaluate policy proposals that impinge on the control and access of biological materials. Stern argues that science and innovation policy must be premised on a clear understanding of the role that knowledge hubs play and the policy mechanisms that encourage their sustained growth and effectiveness. The understanding of complex systems is a key element to predict and control the system’s dynamics. To gain deeper insights into the underlying actions of complex systems today, more and more data of diverse types are analyzed that mirror the systems dynamics, whereas system models are still hard to derive. Data assimilation merges both data and model to an optimal description of complex systems’ dynamics. The present eBook brings together both recent theoretical work in data assimilation and control and demonstrates applications in diverse research fields. In this fascinating book, one of the world's most eminent developmental biologists discusses some of the exciting new insights into how genes control development. Walter Gehring describes in vivid detail his essential contributions to the landmark discovery of the homeobox, a characteristic DNA segment found in the genes of all higher organisms from the fruitfly to humans, and he explains how this has provided the key to our modern understanding of development and evolution. The book thus becomes not only a lucid discussion of genetics but also an engaging description of the art of scientific investigation. Gehring begins his story by looking at the work of the many researchers who laid the foundation for the fields of molecular, cellular, and developmental biology, providing insightful vignettes of past and present investigators. He then describes his laboratory's hunt for the gene that caused odd mutations in the fruitfly--in which, for example, antennae on the head were transformed into legs. He explains that researchers eventually found that the same master control genes that dictate the body plan in flies also pattern human bodies, limbs, hands, heart, and brain. And he illustrates the universality of the genetic control of development by describing the development of the eye; eyes as different as those of humans, squids, and flies, he shows, develop under the same master control gene. During the last decade, national and international scientific

organizations have become increasingly engaged in considering how to respond to the biosecurity implications of developments in the life sciences and in assessing trends in science and technology (S&T) relevant to biological and chemical weapons nonproliferation. The latest example is an international workshop, Trends in Science and Technology Relevant to the Biological Weapons Convention, held October 31 - November 3, 2010 at the Institute of Biophysics of the Chinese Academy of Sciences in Beijing. Life Sciences and Related Fields summarizes the workshop, plenary, and breakout discussion sessions held during this convention. Given the immense diversity of current research and development, the report is only able to provide an overview of the areas of science and technology the committee believes are potentially relevant to the future of the Biological and Toxic Weapons Convention (BWC), although there is an effort to identify areas that seemed particularly ripe for further exploration and analysis. The report offers findings and conclusions organized around three fundamental and frequently cited trends in S&T that affect the scope and operation of the convention: The rapid pace of change in the life sciences and related fields; The increasing diffusion of life sciences research capacity and its applications, both internationally and beyond traditional research institutions; and The extent to which additional scientific and technical disciplines beyond biology are increasingly involved in life sciences research. The report does not make recommendations about policy options to respond to the implications of the identified trends. The choice of such responses rests with the 164 States Parties to the Convention, who must take into account multiple factors beyond the project's focus on the state of the science. Providing students with clear and practical advice on how best to organise experiments and collect data so as to make the subsequent analysis easier and their conclusions more robust, this text assumes no specialist knowledge. Issues in Life Sciences—Bacteriology, Parasitology, and Virology: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Parasitology. The editors have built Issues in Life Sciences—Bacteriology, Parasitology, and Virology: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Parasitology in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Life Sciences—Bacteriology, Parasitology, and Virology: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/. This volume is a comprehensive treatment of how the principles of ecology and conservation biology can be used to maximize biological control. Conservation Biological Control presents various means to modify or manipulate the environment to enhance the activities of natural enemies of pests. It establishes a conceptual link between ecology and the agricultural use of agents for biological control, and discusses both theoretical issues as well as practical management concerns. Certain to be interesting to ecologists and entomologists, this volume will also appeal to scientists, faculty, researchers and students interested in pest management, horticulture, plant sciences, and agriculture. Contains chapters by an international team of leading authorities Establishes a conceptual link between ecology and the agricultural use of agents for biological control Discusses both theoretical issues as well as practical management concerns Provides specific examples of how conservation principles are used to maximize the biological control of pests The complexity of biological systems has intrigued scientists from many disciplines and has given birth to the highly influential field of systems biology wherein a wide array of mathematical techniques, such as flux balance analysis, and technology platforms, such as next generation sequencing, is used to understand, elucidate, and predict the functions of complex biological systems. More recently, the field of synthetic biology, i.e., de novo engineering of biological systems, has emerged. Scientists from various fields are focusing on how to render this engineering process more predictable, reliable, scalable, affordable, and easy. Systems and control theory is a branch of engineering and applied sciences that rigorously deals with the complexities and uncertainties of interconnected systems with the objective of characterising fundamental systemic properties such as stability, robustness, communication capacity, and other performance metrics. Systems and control theory also strives to offer concepts and methods that facilitate the design of systems with rigorous guarantees on these properties. Over the last 100 years, it has made stellar theoretical and technological contributions in diverse fields such as aerospace, telecommunication, storage, automotive, power systems, and others. Can it have, or evolve to have, a similar impact in biology? The chapters in this book demonstrate that, indeed, systems and control theoretic concepts and techniques can have a significant impact in systems and synthetic biology. Volume II contains chapters contributed by leading researchers in the field of systems and synthetic biology that concern modeling physiological processes and bottom-up constructions of scalable biological systems. The modeling problems include characterisation and synthesis of memory, understanding how homoeostasis is maintained in the face of shocks and relatively gradual perturbations, understanding the functioning and robustness of biological clocks such as those at the core of circadian rhythms, and understanding how the cell cycles can be regulated, among others. Some of the bottom-up construction problems investigated in Volume II are as follows: How should biomacromolecules, platforms, and

scalable architectures be chosen and synthesised in order to build programmable de novo biological systems? What are the types of constrained optimisation problems encountered in this process and how can these be solved efficiently? As the eminent computer scientist Donald Knuth put it, "biology easily has 500 years of exciting problems to work on". This edited book presents but a small fraction of those for the benefit of (1) systems and control theorists interested in molecular and cellular biology and (2) biologists interested in rigorous modelling, analysis and control of biological systems. From economics and business to the biological sciences to physics and engineering, professionals successfully use the powerful mathematical tool of optimal control to make management and strategy decisions. Optimal Control Applied to Biological Models thoroughly develops the mathematical aspects of optimal control theory and provides insight into the application of this theory to biological models. Focusing on mathematical concepts, the book first examines the most basic problem for continuous time ordinary differential equations (ODEs) before discussing more complicated problems, such as variations of the initial conditions, imposed bounds on the control, multiple states and controls, linear dependence on the control, and free terminal time. In addition, the authors introduce the optimal control of discrete systems and of partial differential equations (PDEs). Featuring a user-friendly interface, the book contains fourteen interactive sections of various applications, including immunology and epidemic disease models, management decisions in harvesting, and resource allocation models. It also develops the underlying numerical methods of the applications and includes the MATLAB® codes on which the applications are based. Requiring only basic knowledge of multivariable calculus, simple ODEs, and mathematical models, this text shows how to adjust controls in biological systems in order to achieve proper outcomes. These notes are based on (i) a series of lectures that I gave at the 14th Biennial Seminar of the Canadian Mathematical Congress held at the University of Western Ontario August 12-24, 1973 and (li) some of my lectures in a modeling course that I have cotaught in the Division of Bio-Medical Sciences at Brown during the past several years. An earlier version of these notes appeared in the Center for Dynamical Systems Lectures Notes series (CDS LN 73-1, November 1973). I have in this revised and extended version of those earlier notes incorporated a number of changes based both on classroom experience and on my research efforts with several colleagues during the intervening period. The narrow viewpoint of the present notes (use of optimization and control theory in biomedical problems) reflects more the scope of the CMC lectures given in August, 1973 than the scope of my own interests. Indeed, my real interests have included the modeling process itself as well as the contributions made by investiga tors who employ the techniques and ideas of control theory, systems analysis, dif ferential equations, and stochastic processes. Some of these contributions have quite naturally involved application of optimal control theory. But in my opinion many of the interesting efforts being made in modeling in the biomedical sciences encompass much more than the use of control theory. For two weeks in August, 1975 more than 140 mathematicians and other scientists gathered at the Universite de Sherbrooke. The occasion was the 15th Biennial Seminar of the Canadian Mathematical Congress, entitled Mathematics and the Life Sciences. Participants in this inter disciplinary gathering included researchers and graduate students in mathematics, seven different areas of biological science, physics, chemistry and medical science. Geographically, those present came from the United States and the United Kingdom as well as from academic departments and government agencies scattered across Canada. In choosing this particular interdisciplinary topic the programme committee had two chief objectives. These were to promote Canadian research in mathematical problems of the life sciences, and to encourage co-operation and exchanges between mathematical scientists" biologists and medical re searchers. To accomplish these objective the committee assembled a stim ulating programme of lectures and talks. Six principal lecturers each delivered a series of five one-hour lectures in which various aspects of the interaction between mathematics and the life sciences were considered. In addition researchers working in the areas of health, population biology, physiology and development biology and disease processes were invited to give more than 25 hours of complementary talks. Genetic Control of Malaria and Dengue focuses on the knowledge, technology, regulation and ethics of using genetically modified mosquitoes to interrupt the transmission of important vector-borne diseases including Malaria. It contains coverage of the current state of knowledge of vector-borne diseases and how they are currently controlled; vaccine, drug and insecticide development; various strategies for altering the genome of mosquitoes in beneficial ways; and the regulatory, ethical and social environment concerning these strategies. For more than five decades, the prospect of using genetically-modified mosquitoes to control vector-borne disease transmission has been a purely hypothetical scenario. We simply did not have the technology or basic knowledge to be able to do it. With the explosion of field trials and potential interventions in development, Genetic Control of Malaria and Dengue provides a comprehensive overview of research in genetics, microbiology, virology, and ecology involved in the development and implementation of genetic modification programs for virus and disease control. This book is meant to provide a practical guide to researchers, regulators and the general public about how this technology actually works, how it can be improved, and what is still unknown. Includes coverage of vectorial capacity, critical to understanding vector-borne disease transmission Provides a summary of the concepts of both population suppression and population replacement Contains pivotal coverage of ethical and ecological ramifications of genetics-based control strategies Issues in

Biological and Life Sciences Research: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Additional Research. The editors have built Issues in Biological and Life Sciences Research: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Additional Research in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Biological and Life Sciences Research: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/. Written in a self-contained tutorial fashion, this monograph successfully brings the latest theoretical advances in the design of robust adaptive systems to the realm of industrial applications. It provides a theoretical basis for verifying some of the reported industrial successes of existing adaptive control schemes and enables readers to synthesize adaptive versions of their own robust internal model control schemes. This novel, interdisciplinary text presents biological understanding in terms of general underlying principles, treating energy as the overarching theme and emphasizing the all-pervading influence of energy transformation in every process, both living and non-living. Key processes and concepts are explained in turn, culminating in a description of the overall functioning and regulation of a living cell. The book rounds off the story of life with a brief account of the endosymbiotic origins of eukaryotic cells, the development of multicellularity, and the emergence of modern plants and animals. Multidisciplinary research in science is becoming commonplace. However, as traditional boundaries start to break down, researchers are increasingly aware of the deficiencies in their knowledge of related disciplines. Introducing Biological Energetics redresses the reciprocal imbalance in the knowledge levels of physical and biological scientists in particular. Its style of presentation and depth of treatment has been carefully designed to unite these two readerships. Combining control theory and modeling, this textbook introduces and builds on methods for simulating and tackling concrete problems in a variety of applied sciences. Emphasizing "learning by doing," the authors focus on examples and applications to real-world problems. An elementary presentation of advanced concepts, proofs to introduce new ideas, and carefully presented MATLAB® programs help foster an understanding of the basics, but also lead the way to new, independent research. With minimal prerequisites and exercises in each chapter, this work serves as an excellent textbook and reference for graduate and advanced undergraduate students, researchers, and practitioners in mathematics, physics, engineering, computer science, as well as biology, biotechnology, economics, and finance. Reproductive issues from sex and contraception to abortion and cloning have been controversial for centuries, and scientists who attempted to turn the study of reproduction into a discipline faced an uphill struggle. Adele Clarke's engrossing story of the search for reproductive knowledge across the twentieth century is colorful and fraught with conflict. Modern scientific study of reproduction, human and animal, began in the United States in an overlapping triad of fields: biology, medicine, and agriculture. Clarke traces the complicated paths through which physiological approaches to reproduction led to endocrinological approaches, creating along the way new technoscientific products from contraceptives to hormone therapies to new modes of assisted conception—for both humans and animals. She focuses on the changing relations and often uneasy collaborations among scientists and the key social worlds most interested in their work—major philanthropists and a wide array of feminist and medical birth control and eugenics advocates—and recounts vividly how the reproductive sciences slowly acquired standing. By the 1960s, reproduction was disciplined, and the young and contested scientific enterprise proved remarkably successful at attracting private funding and support. But the controversies continue as women—the targeted consumers—create their own reproductive agendas around the world. Elucidating the deep cultural tensions that have permeated reproductive topics historically and in the present, Disciplining Reproduction gets to the heart of the twentieth century's drive to rationalize reproduction, human and nonhuman, in order to control life itself. This title is part of UC Press's Voices Revived program, which commemorates University of California Press's mission to seek out and cultivate the brightest minds and give them voice, reach, and impact. Drawing on a backlist dating to 1893, Voices Revived makes high-quality, peer-reviewed scholarship accessible once again using print-on-demand technology. This title was originally published in 1998. Twenty-nine collected essays represent a critical history of Shakespeare's play as text and as theater, beginning with Samuel Johnson in 1765, and ending with a review of the Royal Shakespeare Company production in 1991. The criticism centers on three aspects of the play: the love/friendship debate. During the last decade, national and international scientific organizations have become increasingly engaged in considering how to respond to the biosecurity implications of developments in the life sciences and in assessing trends in science and technology (S&T) relevant to biological and chemical weapons nonproliferation. The latest example is an international workshop, Trends in Science and Technology Relevant to the Biological Weapons Convention, held October 31 - November 3, 2010 at the Institute of Biophysics of the Chinese Academy of Sciences in Beijing. Life Sciences and Related Fields summarizes the workshop, plenary, and breakout discussion sessions held during this convention. 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able to provide an overview of the areas of science and technology the committee believes are potentially relevant to the future of the Biological and Toxic Weapons Convention (BWC), although there is an effort to identify areas that seemed particularly ripe for further exploration and analysis. The report offers findings and conclusions organized around three fundamental and frequently cited trends in S&T that affect the scope and operation of the convention: The rapid pace of change in the life sciences and related fields; The increasing diffusion of life sciences research capacity and its applications, both internationally and beyond traditional research institutions; and The extent to which additional scientific and technical disciplines beyond biology are increasingly involved in life sciences research. The report does not make recommendations about policy options to respond to the implications of the identified trends. The choice of such responses rests with the 164 States Parties to the Convention, who must take into account multiple factors beyond the project's focus on the state of the science. Semi-active Suspension Control provides an overview of vehicle ride control employing smart semi-active damping systems. These systems are able to tune the amount of damping in response to measured vehicle-ride and handling indicators. Two physically different dampers (magnetorheological and controlled-friction) are analysed from the perspectives of mechatronics and control. Ride comfort, road holding, road damage and human-body modelling are studied. Mathematical modelling is balanced by a large and detailed section on experimental implementation, where a variety of automotive applications are described offering a well-rounded view. The implementation of control algorithms with regard to real-life engineering constraints is emphasised. The applications described include semi-active suspensions for a saloon car, seat suspensions for vehicles not equipped with a primary suspension, and control of heavy-vehicle dynamic-tyre loads to reduce road damage and improve handling. Maia is the story of an idea, and its development into a working hypothesis, that provides a cybernetic interpretation of how growth is controlled. Growth at the lowest level is controlled by regulating the rate of growth. Access to the output of control mechanisms is provided by perturbing the growing organism, and then filtering out the consequences to growth rate. The output of the growth control mechanism is then accessible for interpretation and modelling. Perturbation experiments have been used to provide interpretations of hormesis, the neutralization of inhibitory load and acquired tolerance to toxic inhibition, and catch-up growth. The account begins with an introduction to cybernetics covering the regulation of growth and population increase in animals and man and describes this new approach to access the control of growth processes. This book is suitable for postgraduate students of biological cybernetics and researchers of biological growth, endocrinology, population ecology and toxicology. Design, Operation, and Control of Insect-Rearing Systems: Science, Technology, and Infrastructure explains the fundamental components of insect rearing: 1) the rearing systems, per se 2) personnel 3) education of rearing personnel 4) communication of procedures 5) an in-depth look at silkworm rearing 5) facilities where rearing is conducted, and 6) funding for all these components. Insect rearing serves a wide array of purposes, including research, pest control by sterile insect technique and biological control, production of insects as food for other animals, conservation, education, and even far-reaching technology where insects are used to produce products such as pharmaceutical materials and strong, multipurpose textiles. This book surveys and analyzes insect rearing from a scientific and technology-based approach. At its foundation, this approach assumes that rearing systems are complex interactions of components that can be understood and controlled by using a mechanistic approach. Author Allen Carson Cohen explains the infrastructure of rearing systems, their current status and character, and what kind of changes can be made to improve the field of insect rearing. Two Appendices republish out-of-print monographs that provide fascinating historical context to the development of the insect-rearing systems we have today. Like engineering systems, biological systems must also operate effectively in the presence of internal and external uncertainty—such as genetic mutations or temperature changes, for example. It is not surprising, then, that evolution has resulted in the widespread use of feedback, and research in systems biology over the past decade has shown that feedback control systems are widely found in biology. As an increasing number of researchers in the life sciences become interested in control-theoretic ideas such as feedback, stability, noise and disturbance attenuation, and robustness, there is a need for a text that explains feedback control as it applies to biological systems. Written by established researchers in both control engineering and systems biology, Feedback Control in Systems Biology explains how feedback control concepts can be applied to systems biology. Filling the need for a text on control theory for systems biologists, it provides an overview of relevant ideas and methods from control engineering and illustrates their application to the analysis of biological systems with case studies in cellular and molecular biology. Control Theory for Systems Biologists The book focuses on the fundamental concepts used to analyze the effects of feedback in biological control systems, rather than the control system design methods that form the core of most control textbooks. In addition, the authors do not assume that readers are familiar with control theory. They focus on "control applications" such as metabolic and gene-regulatory networks rather than aircraft, robots, or engines, and on mathematical models derived from classical reaction kinetics rather than classical mechanics. Another significant feature of the book is that it discusses nonlinear systems, an understanding of which is crucial for systems biologists because of the highly nonlinear nature of biological systems. The authors cover tools and techniques for the analysis of linear and nonlinear systems; negative

and positive feedback; robustness analysis methods; techniques for the reverse-engineering of biological interaction networks; and the analysis of stochastic biological control systems. They also identify new research directions for control theory inspired by the dynamic characteristics of biological systems. A valuable reference for researchers, this text offers a sound starting point for scientists entering this fascinating and rapidly developing field.

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