

Mathematical Biology I An Introduction Interdiscip

THIS IS LIKEWISE ONE OF THE FACTORS BY OBTAINING THE SOFT DOCUMENTS OF THIS **MATHEMATICAL BIOLOGY I AN INTRODUCTION INTERDISCIP** BY ONLINE. YOU MIGHT NOT REQUIRE MORE GROW OLD TO SPEND TO GO TO THE BOOKS ESTABLISHMENT AS WITH EASE AS SEARCH FOR THEM. IN SOME CASES, YOU LIKEWISE ATTAIN NOT DISCOVER THE REVELATION MATHEMATICAL BIOLOGY I AN INTRODUCTION INTERDISCIP THAT YOU ARE LOOKING FOR. IT WILL VERY SQUANDER THE TIME.

HOWEVER BELOW, CONSIDERING YOU VISIT THIS WEB PAGE, IT WILL BE CONSEQUENTLY ENORMOUSLY EASY TO ACQUIRE AS SKILLFULLY AS DOWNLOAD GUIDE MATHEMATICAL BIOLOGY I AN INTRODUCTION INTERDISCIP

IT WILL NOT ACKNOWLEDGE MANY PERIOD AS WE ACCUSTOM BEFORE. YOU CAN ACCOMPLISH IT EVEN IF WORK SOMETHING ELSE AT HOUSE AND EVEN IN YOUR WORKPLACE. FOR THAT REASON EASY! SO, ARE YOU QUESTION? JUST EXERCISE JUST WHAT WE PROVIDE UNDER AS SKILLFULLY AS EVALUATION **MATHEMATICAL BIOLOGY I AN INTRODUCTION INTERDISCIP** WHAT YOU ONCE TO READ!

MATHEMATICAL BIOLOGY JAMES DICKSON MURRAY 2002

INTRODUCTION TO BIOLOGICAL NETWORKS ALPAN RAVAL 2016-04-19 THE NEW RESEARCH AREA OF GENOMICS-INSPIRED NETWORK BIOLOGY LACKS AN INTRODUCTORY BOOK THAT ENABLES BOTH PHYSICAL/COMPUTATIONAL SCIENTISTS AND BIOLOGISTS TO OBTAIN A GENERAL YET SUFFICIENTLY RIGOROUS PERSPECTIVE OF CURRENT THINKING. FILLING THIS GAP, INTRODUCTION TO BIOLOGICAL NETWORKS PROVIDES A THOROUGH INTRODUCTION TO GENOMICS-INSPIRED NETWORK BI

AN INTRODUCTION TO SYSTEMS BIOLOGY URI ALON 2006-07-07 THOROUGH AND ACCESSIBLE, THIS BOOK PRESENTS THE DESIGN PRINCIPLES OF BIOLOGICAL SYSTEMS, AND HIGHLIGHTS THE RECURRING CIRCUIT ELEMENTS THAT MAKE UP BIOLOGICAL NETWORKS. IT PROVIDES A SIMPLE MATHEMATICAL FRAMEWORK WHICH CAN BE USED TO UNDERSTAND AND EVEN DESIGN BIOLOGICAL CIRCUITS. THE TEXT AVOIDS SPECIALIST TERMS, FOCUSING INSTEAD ON SEVERAL WELL-STUDIED BIOLOGICAL SYSTEMS THAT CONCISELY DEMONSTRATE KEY PRINCIPLES. AN INTRODUCTION TO SYSTEMS BIOLOGY: DESIGN PRINCIPLES OF BIOLOGICAL CIRCUITS BUILDS A SOLID FOUNDATION FOR THE INTUITIVE UNDERSTANDING OF GENERAL PRINCIPLES. IT ENCOURAGES THE READER TO ASK WHY A SYSTEM IS DESIGNED IN A PARTICULAR WAY AND THEN PROCEEDS TO ANSWER WITH SIMPLIFIED MODELS.

MATHEMATICAL MODELING IN SYSTEMS BIOLOGY BRIAN P. INGALLS 2013-07-05 AN INTRODUCTION TO THE MATHEMATICAL CONCEPTS AND TECHNIQUES NEEDED FOR THE CONSTRUCTION AND ANALYSIS OF MODELS IN MOLECULAR SYSTEMS BIOLOGY. SYSTEMS TECHNIQUES ARE INTEGRAL TO CURRENT RESEARCH IN MOLECULAR CELL BIOLOGY, AND SYSTEM-LEVEL INVESTIGATIONS ARE OFTEN ACCOMPANIED BY MATHEMATICAL MODELS. THESE MODELS SERVE AS WORKING HYPOTHESES: THEY HELP US TO UNDERSTAND AND PREDICT THE BEHAVIOR OF COMPLEX SYSTEMS. THIS BOOK OFFERS AN INTRODUCTION TO MATHEMATICAL CONCEPTS AND TECHNIQUES NEEDED FOR THE CONSTRUCTION AND INTERPRETATION OF MODELS IN MOLECULAR SYSTEMS BIOLOGY. IT IS ACCESSIBLE TO UPPER-LEVEL UNDERGRADUATE OR GRADUATE STUDENTS IN LIFE SCIENCE OR ENGINEERING WHO HAVE SOME FAMILIARITY WITH CALCULUS, AND WILL BE A USEFUL REFERENCE FOR RESEARCHERS AT ALL LEVELS. THE FIRST FOUR CHAPTERS COVER THE BASICS OF MATHEMATICAL MODELING IN MOLECULAR SYSTEMS BIOLOGY. THE LAST FOUR CHAPTERS ADDRESS SPECIFIC BIOLOGICAL DOMAINS, TREATING MODELING OF METABOLIC NETWORKS, OF SIGNAL TRANSDUCTION PATHWAYS, OF GENE REGULATORY NETWORKS, AND OF ELECTROPHYSIOLOGY AND NEURONAL ACTION POTENTIALS. CHAPTERS 3-8 END WITH OPTIONAL SECTIONS THAT ADDRESS MORE SPECIALIZED MODELING TOPICS. EXERCISES, SOLVABLE WITH PEN-AND-PAPER CALCULATIONS, APPEAR THROUGHOUT THE TEXT TO ENCOURAGE INTERACTION WITH THE MATHEMATICAL TECHNIQUES. MORE INVOLVED END-OF-CHAPTER PROBLEM SETS REQUIRE COMPUTATIONAL SOFTWARE. APPENDIXES PROVIDE A REVIEW OF BASIC CONCEPTS OF MOLECULAR BIOLOGY, ADDITIONAL MATHEMATICAL BACKGROUND MATERIAL, AND TUTORIALS FOR TWO COMPUTATIONAL SOFTWARE PACKAGES (XPPAUT AND MATLAB) THAT CAN BE USED FOR MODEL SIMULATION AND ANALYSIS.

INTERDISCIPLINARY RESEARCH AND APPLICATIONS IN BIOINFORMATICS, COMPUTATIONAL BIOLOGY, AND ENVIRONMENTAL SCIENCES LIU, LIMIN ANGELA 2010-10-31 "THIS BOOK PRESENTS CUTTING-EDGE RESEARCH IN THE FIELD OF COMPUTATIONAL AND SYSTEMS BIOLOGY, PRESENTING STUDIES RANGING FROM THE ATOMIC/MOLECULAR LEVEL TO THE GENOMIC LEVEL AND COVERING A WIDE SPECTRUM OF IMPORTANT BIOLOGICAL PROBLEMS AND APPLICATIONS"--PROVIDED BY PUBLISHER.

THE GEOMETRY OF BIOLOGICAL TIME ARTHUR T. WINFREE 2013-06-29 AS I REVIEW THESE PAGES, THE LAST OF THEM WRITTEN IN SUMMER 1978, SOME RETROSPECTIVE THOUGHTS COME TO MIND WHICH PUT THE WHOLE BUSINESS INTO BETTER PERSPECTIVE FOR ME AND MIGHT AID THE PROSPECTIVE READER IN CHOOSING HOW TO APPROACH THIS VOLUME. THE MOST CONSPICUOUS THOUGHT IN MY MIND AT PRESENT IS THE DIVERSITY OF WHOLLY INDEPENDENT EXPLORATIONS THAT CAME UPON PHASE SINGULARITIES, IN ONE GUISE OR ANOTHER, DURING THE PAST DECADE. MY EFFORTS TO GATHER THE PUBLISHED LITERATURE DURING THE LAST PHASES OF ACTUALLY WRITING A WHOLE BOOK ABOUT THEM WERE ALMOST EQUALLY DIVIDED BETWEEN LIBRARIES OF BIOLOGY, CHEMISTRY, ENGINEERING, MATHEMATICS, MEDICINE, AND PHYSICS. A LOT OF WHAT I CALL "GATHERING" WAS DONE SOMEWHAT IN ANTICIPATION IN THE FORM OF CONJECTURE, QUERY, AND PREDICTION BASED ON ANALOGY BETWEEN DEVELOPMENTS IN DIFFERENT FIELDS. THE CONSEQUENCE THROUGHOUT 1979 WAS THAT OUR LONG-SUFFERING PUBLISHER REPEATEDLY HAD TO REPLACE SUCH MATERIAL BY CITATION OF UNEXPECTED FLURRIES OF PAPERS GIVING SUBSTANTIVE DEMONSTRATION. I TRUST THAT THE AUTHORS OF THESE MANY EXCELLENT REPORTS, AND ESPECIALLY OF THOSE I ONLY FOUND TOO LATE, WILL FORGIVE THE BREVITY OF ALLUSION I FELT COMPELLED TO OBSERVE IN THESE SUBSTITUTIONS. A RESIDUE OF LOOSE ENDS IS LARGELY COLLECTED IN THE INDEX UNDER "QUERIES." IT IS CLEAR TO ME ALREADY THAT THE MATERIALS I BEGAN TO GATHER SEVERAL YEARS AGO REPRESENTED ONLY THE FIRST FLICKERING OF WHAT TURNS OUT TO BE A SUBSTANTIAL CONFLAGRATION.

MOLECULAR MODELING AND SIMULATION: AN INTERDISCIPLINARY GUIDE TAMAR SCHLICK 2010-08-03 VERY BROAD OVERVIEW OF THE FIELD INTENDED FOR AN INTERDISCIPLINARY AUDIENCE; LIVELY DISCUSSION OF CURRENT CHALLENGES WRITTEN IN A COLLOQUIAL STYLE; AUTHOR IS A RISING STAR IN THIS DISCIPLINE; SUITABLY ACCESSIBLE FOR BEGINNERS AND SUITABLY RIGOROUS FOR EXPERTS; FEATURES EXTENSIVE FOUR-COLOR ILLUSTRATIONS; APPENDICES FEATURING HOMEWORK ASSIGNMENTS AND READING LISTS COMPLEMENT THE MATERIAL IN THE MAIN TEXT

INTRODUCTION TO MATHEMATICAL BIOLOGY S. I. RUBINOW 2002 DESIGNED TO EXPLORE THE APPLICATIONS OF MATHEMATICAL TECHNIQUES AND METHODS RELATED TO BIOLOGY, THIS TEXT EXPLORES FIVE AREAS: CELL GROWTH, ENZYMATIC REACTIONS, PHYSIOLOGICAL TRACERS, BIOLOGICAL FLUID DYNAMICS AND DIFFUSION. TOPICS ESSENTIALLY FOLLOW A COURSE IN ELEMENTARY DIFFERENTIAL EQUATIONS — SOME LINEAR ALGEBRA AND GRAPH THEORY; REQUIRES ONLY A KNOWLEDGE OF ELEMENTARY CALCULUS.

AN INTRODUCTION TO MATHEMATICAL BIOLOGY LINDA J. S. ALLEN 2007 KEY BENEFIT: THIS REFERENCE INTRODUCES A VARIETY OF MATHEMATICAL MODELS FOR BIOLOGICAL SYSTEMS, AND PRESENTS THE MATHEMATICAL THEORY AND TECHNIQUES USEFUL IN ANALYZING THOSE MODELS. MATERIAL IS ORGANIZED ACCORDING TO THE MATHEMATICAL THEORY RATHER THAN THE BIOLOGICAL APPLICATION. CONTAINS APPLICATIONS OF MATHEMATICAL THEORY TO BIOLOGICAL EXAMPLES IN EACH CHAPTER. FOCUSES ON DETERMINISTIC MATHEMATICAL MODELS WITH AN EMPHASIS ON PREDICTING THE QUALITATIVE SOLUTION BEHAVIOR OVER TIME. DISCUSSES CLASSICAL MATHEMATICAL MODELS FROM POPULATION, INCLUDING THE LESLIE MATRIX MODEL, THE NICHOLSON-BAILEY MODEL, AND THE LOTKA-VOLTERRA PREDATOR-PREY MODEL. ALSO DISCUSSES MORE RECENT MODELS, SUCH AS A MODEL FOR THE HUMAN IMMUNODEFICIENCY VIRUS - HIV AND A MODEL FOR FLOUR BEETLES. KEY MARKET: READERS SEEKING A SOLID BACKGROUND IN THE MATHEMATICS BEHIND MODELING IN BIOLOGY AND EXPOSURE TO A WIDE VARIETY OF MATHEMATICAL MODELS IN BIOLOGY.

MATHEMATICAL BIOLOGY JAMES D. MURRAY 2013-06-09 MATHEMATICAL BIOLOGY IS A RICHLY ILLUSTRATED TEXTBOOK IN AN EXCITING AND FAST GROWING FIELD. PROVIDING AN IN-DEPTH LOOK AT THE PRACTICAL USE OF MATH MODELING, IT FEATURES EXERCISES THROUGHOUT THAT ARE DRAWN FROM A VARIETY OF BIOSCIENTIFIC DISCIPLINES - POPULATION BIOLOGY, DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, EPIDEMIOLOGY, AND EVOLUTION, AMONG OTHERS. IT MAINTAINS A CONSISTENT LEVEL THROUGHOUT SO THAT GRADUATE STUDENTS CAN USE IT TO GAIN A Foothold INTO THIS DYNAMIC RESEARCH AREA.

PROVING DARWIN GREGORY CHAITIN 2013-02-26 GROUNDBREAKING MATHEMATICIAN GREGORY CHAITIN GIVES US THE FIRST BOOK TO POSIT THAT WE CAN PROVE HOW DARWIN'S THEORY OF EVOLUTION WORKS ON A MATHEMATICAL LEVEL. FOR YEARS IT HAS BEEN RECEIVED WISDOM AMONG MOST SCIENTISTS THAT, JUST AS DARWIN CLAIMED, ALL OF THE EARTH'S LIFE-FORMS EVOLVED BY BLIND CHANCE. BUT DOES DARWIN'S THEORY FUNCTION ON A PURELY MATHEMATICAL LEVEL? HAS THERE BEEN ENOUGH TIME FOR EVOLUTION TO PRODUCE THE REMARKABLE BIOLOGICAL DIVERSITY WE SEE AROUND US? IT'S A QUESTION NO ONE HAS YET ANSWERED—IN FACT, NO ONE HAS ATTEMPTED TO ANSWER IT UNTIL NOW. IN THIS ILLUMINATING AND PROVOCATIVE BOOK, GREGORY CHAITIN ELUCIDATES THE MATHEMATICAL SCHEME HE'S DEVELOPED THAT CAN EXPLAIN LIFE ITSELF, AND EXAMINES THE WORKS OF MATHEMATICAL PIONEERS JOHN VON NEUMANN AND ALAN TURING THROUGH THE LENS OF BIOLOGY. FASCINATING AND THOUGHT-PROVOKING, PROVING DARWIN MAKES CLEAR HOW BIOLOGY MAY HAVE FOUND ITS GREATEST ALLY IN MATHEMATICS.

STOCHASTIC PROCESSES IN CELL BIOLOGY PAUL C. BRESSLOFF 2014-08-22 THIS BOOK DEVELOPS THE THEORY OF CONTINUOUS AND DISCRETE STOCHASTIC PROCESSES WITHIN THE CONTEXT OF CELL BIOLOGY. A WIDE RANGE OF BIOLOGICAL TOPICS ARE COVERED INCLUDING NORMAL AND ANOMALOUS DIFFUSION IN COMPLEX CELLULAR ENVIRONMENTS, STOCHASTIC ION

CHANNELS AND EXCITABLE SYSTEMS, STOCHASTIC CALCIUM SIGNALING, MOLECULAR MOTORS, INTRACELLULAR TRANSPORT, SIGNAL TRANSDUCTION, BACTERIAL CHEMOTAXIS, ROBUSTNESS IN GENE NETWORKS, GENETIC SWITCHES AND OSCILLATORS, CELL POLARIZATION, POLYMERIZATION, CELLULAR LENGTH CONTROL, AND BRANCHING PROCESSES. THE BOOK ALSO PROVIDES A PEDAGOGICAL INTRODUCTION TO THE THEORY OF STOCHASTIC PROCESS – FOKKER PLANCK EQUATIONS, STOCHASTIC DIFFERENTIAL EQUATIONS, MASTER EQUATIONS AND JUMP MARKOV PROCESSES, DIFFUSION APPROXIMATIONS AND THE SYSTEM SIZE EXPANSION, FIRST PASSAGE TIME PROBLEMS, STOCHASTIC HYBRID SYSTEMS, REACTION-DIFFUSION EQUATIONS, EXCLUSION PROCESSES, WKB METHODS, MARTINGALES AND BRANCHING PROCESSES, STOCHASTIC CALCULUS, AND NUMERICAL METHODS. THIS TEXT IS PRIMARILY AIMED AT GRADUATE STUDENTS AND RESEARCHERS WORKING IN MATHEMATICAL BIOLOGY AND APPLIED MATHEMATICIANS INTERESTED IN STOCHASTIC MODELING. APPLIED PROBABILISTS AND THEORETICAL PHYSICISTS SHOULD ALSO FIND IT OF INTEREST. IT ASSUMES NO PRIOR BACKGROUND IN STATISTICAL PHYSICS AND INTRODUCES CONCEPTS IN STOCHASTIC PROCESSES VIA MOTIVATING BIOLOGICAL APPLICATIONS. THE BOOK IS HIGHLY ILLUSTRATED AND CONTAINS A LARGE NUMBER OF EXAMPLES AND EXERCISES THAT FURTHER DEVELOP THE MODELS AND IDEAS IN THE BODY OF THE TEXT. IT IS BASED ON A COURSE THAT THE AUTHOR HAS TAUGHT AT THE UNIVERSITY OF UTAH FOR MANY YEARS.

AN INTRODUCTION TO UNDERGRADUATE RESEARCH IN COMPUTATIONAL AND MATHEMATICAL BIOLOGY HANNAH CALLENDER HIGHLANDER 2020-02-17 SPEAKING DIRECTLY TO THE GROWING IMPORTANCE OF RESEARCH EXPERIENCE IN UNDERGRADUATE MATHEMATICS PROGRAMS, THIS VOLUME OFFERS SUGGESTIONS FOR UNDERGRADUATE-APPROPRIATE RESEARCH PROJECTS IN MATHEMATICAL AND COMPUTATIONAL BIOLOGY FOR STUDENTS AND THEIR FACULTY MENTORS. THE AIM OF EACH CHAPTER IS TWOFOLD: FOR FACULTY, TO ALLEVIATE THE CHALLENGES OF IDENTIFYING ACCESSIBLE TOPICS AND ADVISING STUDENTS THROUGH THE RESEARCH PROCESS; FOR STUDENTS, TO PROVIDE SUFFICIENT BACKGROUND, ADDITIONAL REFERENCES, AND CONTEXT TO EXCITE STUDENTS IN THESE AREAS AND TO ENABLE THEM TO SUCCESSFULLY UNDERTAKE THESE PROBLEMS IN THEIR RESEARCH. SOME OF THE TOPICS DISCUSSED INCLUDE: • OSCILLATORY BEHAVIORS PRESENT IN REAL-WORLD APPLICATIONS, FROM SEASONAL OUTBREAKS OF CHILDHOOD DISEASES TO ACTION POTENTIALS IN NEURONS • SIMULATING BACTERIAL GROWTH, COMPETITION, AND RESISTANCE WITH AGENT-BASED MODELS AND LABORATORY EXPERIMENTS • NETWORK STRUCTURE AND THE DYNAMICS OF BIOLOGICAL SYSTEMS • USING NEURAL NETWORKS TO IDENTIFY BIRD SPECIES FROM BIRDSONG SAMPLES • MODELING FLUID FLOW INDUCED BY THE MOTION OF PULMONARY CILIA AIMED AT UNDERGRADUATE MATHEMATICS FACULTY AND ADVANCED UNDERGRADUATE STUDENTS, THIS UNIQUE GUIDE WILL BE A VALUABLE RESOURCE FOR GENERATING FRUITFUL RESEARCH COLLABORATIONS BETWEEN STUDENTS AND FACULTY.

OPTIMAL CONTROL APPLIED TO BIOLOGICAL MODELS SUZANNE LENHART 2007-05-07 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.

MATHEMATICAL BIOLOGY RONALD W. SHONKWILER 2009-08-04 THIS TEXT PRESENTS MATHEMATICAL BIOLOGY AS A FIELD WITH A UNITY OF ITS OWN, RATHER THAN ONLY THE INTRUSION OF ONE SCIENCE INTO ANOTHER. THE BOOK FOCUSES ON PROBLEMS OF CONTEMPORARY INTEREST, SUCH AS CANCER, GENETICS, AND THE RAPIDLY GROWING FIELD OF GENOMICS.

MOLECULAR MODELING AND SIMULATION TAMAR SCHLICK 2013-04-18 VERY BROAD OVERVIEW OF THE FIELD INTENDED FOR AN INTERDISCIPLINARY AUDIENCE; LIVELY DISCUSSION OF CURRENT CHALLENGES WRITTEN IN A COLLOQUIAL STYLE; AUTHOR IS A RISING STAR IN THIS DISCIPLINE; SUITABLY ACCESSIBLE FOR BEGINNERS AND SUITABLY RIGOROUS FOR EXPERTS; FEATURES EXTENSIVE FOUR-COLOR ILLUSTRATIONS; APPENDICES FEATURING HOMEWORK ASSIGNMENTS AND READING LISTS COMPLEMENT THE MATERIAL IN THE MAIN TEXT

MATHEMATICAL FOUNDATIONS OF NEUROSCIENCE G. BARD ERMENTROUT 2010-07-01 THIS BOOK APPLIES METHODS FROM NONLINEAR DYNAMICS TO PROBLEMS IN NEUROSCIENCE. IT USES MODERN MATHEMATICAL APPROACHES TO UNDERSTAND PATTERNS OF

NEURONAL ACTIVITY SEEN IN EXPERIMENTS AND MODELS OF NEURONAL BEHAVIOR. THE INTENDED AUDIENCE IS RESEARCHERS INTERESTED IN APPLYING MATHEMATICS TO IMPORTANT PROBLEMS IN NEUROSCIENCE, AND NEUROSCIENTISTS WHO WOULD LIKE TO UNDERSTAND HOW TO CREATE MODELS, AS WELL AS THE MATHEMATICAL AND COMPUTATIONAL METHODS FOR ANALYZING THEM. THE AUTHORS TAKE A VERY BROAD APPROACH AND USE MANY DIFFERENT METHODS TO SOLVE AND UNDERSTAND COMPLEX MODELS OF NEURONS AND CIRCUITS. THEY EXPLAIN AND COMBINE NUMERICAL, ANALYTICAL, DYNAMICAL SYSTEMS AND PERTURBATION METHODS TO PRODUCE A MODERN APPROACH TO THE TYPES OF MODEL EQUATIONS THAT ARISE IN NEUROSCIENCE. THERE ARE EXTENSIVE CHAPTERS ON THE ROLE OF NOISE, MULTIPLE TIME SCALES AND SPATIAL INTERACTIONS IN GENERATING COMPLEX ACTIVITY PATTERNS FOUND IN EXPERIMENTS. THE EARLY CHAPTERS REQUIRE LITTLE MORE THAN BASIC CALCULUS AND SOME ELEMENTARY DIFFERENTIAL EQUATIONS AND CAN FORM THE CORE OF A COMPUTATIONAL NEUROSCIENCE COURSE. LATER CHAPTERS CAN BE USED AS A BASIS FOR A GRADUATE CLASS AND AS A SOURCE FOR CURRENT RESEARCH IN MATHEMATICAL NEUROSCIENCE. THE BOOK CONTAINS A LARGE NUMBER OF ILLUSTRATIONS, CHAPTER SUMMARIES AND HUNDREDS OF EXERCISES WHICH ARE MOTIVATED BY ISSUES THAT ARISE IN BIOLOGY, AND INVOLVE BOTH COMPUTATION AND ANALYSIS. BARD ERMENTROUT IS PROFESSOR OF COMPUTATIONAL BIOLOGY AND PROFESSOR OF MATHEMATICS AT THE UNIVERSITY OF PITTSBURGH. DAVID TERMAN IS PROFESSOR OF MATHEMATICS AT THE OHIO STATE UNIVERSITY.

NONLINEAR PDES MARIUS GHERGU 2011-10-22 THE EMPHASIS THROUGHOUT THE PRESENT VOLUME IS ON THE PRACTICAL APPLICATION OF THEORETICAL MATHEMATICAL MODELS HELPING TO UNRAVEL THE UNDERLYING MECHANISMS INVOLVED IN PROCESSES FROM MATHEMATICAL PHYSICS AND BIOSCIENCES. IT HAS BEEN CONCEIVED AS A UNIQUE COLLECTION OF ABSTRACT METHODS DEALING ESPECIALLY WITH NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS (EITHER STATIONARY OR EVOLUTIONARY) THAT ARE APPLIED TO UNDERSTAND CONCRETE PROCESSES INVOLVING SOME IMPORTANT APPLICATIONS RELATED TO PHENOMENA SUCH AS: BOUNDARY LAYER PHENOMENA FOR VISCOUS FLUIDS, POPULATION DYNAMICS,, DEAD CORE PHENOMENA, ETC. IT ADDRESSES RESEARCHERS AND POST-GRADUATE STUDENTS WORKING AT THE INTERPLAY BETWEEN MATHEMATICS AND OTHER FIELDS OF SCIENCE AND TECHNOLOGY AND IS A COMPREHENSIVE INTRODUCTION TO THE THEORY OF NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS AND ITS MAIN PRINCIPLES ALSO PRESENTS THEIR REAL-LIFE APPLICATIONS IN VARIOUS CONTEXTS: MATHEMATICAL PHYSICS, CHEMISTRY, MATHEMATICAL BIOLOGY, AND POPULATION GENETICS. BASED ON THE AUTHORS' ORIGINAL WORK, THIS VOLUME PROVIDES AN OVERVIEW OF THE FIELD, WITH EXAMPLES SUITABLE FOR RESEARCHERS BUT ALSO FOR GRADUATE STUDENTS ENTERING RESEARCH. THE METHOD OF PRESENTATION APPEALS TO READERS WITH DIVERSE BACKGROUNDS IN PARTIAL DIFFERENTIAL EQUATIONS AND FUNCTIONAL ANALYSIS. EACH CHAPTER INCLUDES DETAILED HEURISTIC ARGUMENTS, PROVIDING THOROUGH MOTIVATION FOR THE MATERIAL DEVELOPED LATER IN THE TEXT. THE CONTENT DEMONSTRATES IN A FIRM WAY THAT PARTIAL DIFFERENTIAL EQUATIONS CAN BE USED TO ADDRESS A LARGE VARIETY OF PHENOMENA OCCURRING IN AND INFLUENCING OUR DAILY LIVES. THE EXTENSIVE REFERENCE LIST AND INDEX MAKE THIS BOOK A VALUABLE RESOURCE FOR RESEARCHERS WORKING IN A VARIETY OF FIELDS AND WHO ARE INTERESTED IN PHENOMENA MODELED BY NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS.

MATHEMATICAL POPULATION GENETICS 1 WARREN J. EWENS 2012-10-01 THIS IS THE FIRST OF A PLANNED TWO-VOLUME WORK DISCUSSING THE MATHEMATICAL ASPECTS OF POPULATION GENETICS WITH AN EMPHASIS ON EVOLUTIONARY THEORY. THIS VOLUME DRAWS HEAVILY FROM THE AUTHOR'S 1979 CLASSIC, BUT IT HAS BEEN REVISED AND EXPANDED TO INCLUDE RECENT TOPICS WHICH FOLLOW NATURALLY FROM THE TREATMENT IN THE EARLIER EDITION, SUCH AS THE THEORY OF MOLECULAR POPULATION GENETICS.

METHODS AND MODELS IN MATHEMATICAL BIOLOGY JOHANNES MÜLLER 2015-08-13 THIS BOOK DEVELOPED FROM CLASSES IN MATHEMATICAL BIOLOGY TAUGHT BY THE AUTHORS OVER SEVERAL YEARS AT THE TECHNISCHE UNIVERSITÄT MÜNCHEN. THE MAIN THEMES ARE MODELING PRINCIPLES, MATHEMATICAL PRINCIPLES FOR THE ANALYSIS OF THESE MODELS AND MODEL-BASED ANALYSIS OF DATA. THE KEY TOPICS OF MODERN BIOMATHEMATICS ARE COVERED: ECOLOGY, EPIDEMIOLOGY, BIOCHEMISTRY, REGULATORY NETWORKS, NEURONAL NETWORKS AND POPULATION GENETICS. A VARIETY OF MATHEMATICAL METHODS ARE INTRODUCED, RANGING FROM ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS TO STOCHASTIC GRAPH THEORY AND BRANCHING PROCESSES. A SPECIAL EMPHASIS IS PLACED ON THE INTERPLAY BETWEEN STOCHASTIC AND DETERMINISTIC MODELS.

MATHEMATICAL BIOLOGY JAMES D. MURRAY 2013-06-29 MATHEMATICS HAS ALWAYS BENEFITED FROM ITS INVOLVEMENT WITH DEVELOPING SCIENCES. EACH SUCCESSIVE INTERACTION REVITALISES AND ENHANCES THE FIELD. BIOMEDICAL SCIENCE IS CLEARLY THE PREMIER SCIENCE OF THE FORESEEABLE FUTURE. FOR THE CONTINUING HEALTH OF THEIR SUBJECT MATHEMATICIANS MUST BECOME INVOLVED WITH BIOLOGY. WITH THE EXAMPLE OF HOW MATHEMATICS HAS BENEFITED FROM AND INFLUENCED PHYSICS, IT IS CLEAR THAT IF MATHEMATICIANS DO NOT BECOME INVOLVED IN THE BIOSCIENCES THEY WILL SIMPLY NOT BE A PART OF WHAT ARE LIKELY TO BE THE MOST IMPORTANT AND EXCITING SCIENTIFIC DISCOVERIES OF ALL TIME. MATHEMATICAL BIOLOGY IS A FAST GROWING, WELL RECOGNISED, ALBEIT NOT CLEARLY DEFINED, SUBJECT AND IS, TO MY MIND, THE MOST EXCITING MODERN APPLICATION OF MATHEMATICS. THE INCREASING USE OF MATHEMATICS IN BIOLOGY IS INEVITABLE AS BIOLOGY BECOMES MORE QUANTITATIVE. THE COMPLEXITY OF THE BIOLOGICAL SCIENCES MAKES INTERDISCIPLINARY INVOLVEMENT ESSENTIAL. FOR THE MATHEMATICIAN, BIOLOGY

OPENS UP NEW AND EXCITING BRANCHES WHILE FOR THE BIOLOGIST MATHEMATICAL MODELLING OFFERS ANOTHER RESEARCH TOOL COMMENSURATE WITH A NEW POWERFUL LABORATORY TECHNIQUE BUT ONLY IF USED APPROPRIATELY AND ITS LIMITATIONS RECOGNISED. HOWEVER, THE USE OF ESOTERIC MATHEMATICS ARROGANTLY APPLIED TO BIOLOGICAL PROBLEMS BY MATHEMATICIANS WHO KNOW LITTLE ABOUT THE REAL BIOLOGY, TOGETHER WITH UNSUBSTANTIATED CLAIMS AS TO HOW IMPORTANT SUCH THEORIES ARE, DOES LITTLE TO PROMOTE THE INTERDISCIPLINARY INVOLVEMENT WHICH IS SO ESSENTIAL. MATHEMATICAL BIOLOGY RESEARCH, TO BE USEFUL AND INTERESTING, MUST BE RELEVANT BIOLOGICALLY.

INTERDISCIPLINARY MATHEMATICS EDUCATION BRIAN DOIG 2019-02-22 THIS OPEN ACCESS BOOK IS THE FIRST MAJOR PUBLICATION ON THE TOPIC OF “INTERDISCIPLINARY MATHEMATICS EDUCATION” AND AROSE FROM THE WORK OF THE FIRST INTERNATIONAL TOPIC STUDY GROUP OF THE SAME NAME AT THE ICME-13 CONFERENCE IN HAMBURG IN 2016. IT OFFERS EXTENSIVE THEORETICAL INSIGHTS, EMPIRICAL RESEARCH, AND PRACTITIONER ACCOUNTS OF INTERDISCIPLINARY MATHEMATICS WORK IN STEM AND BEYOND (E.G. IN MUSIC AND THE ARTS). SCHOLARS AND PRACTITIONERS FROM FOUR CONTINENTS CONTRIBUTED TO THIS COMPREHENSIVE BOOK, AND PRESENT STUDIES ON: THE CONCEPTUALIZATIONS OF INTERDISCIPLINARITY; IMPLEMENTATION CASES AT SCHOOLS AND TERTIARY INSTITUTIONS; TEACHER EDUCATION; AND IMPLICATIONS FOR POLICY AND PRACTICE. EACH CHAPTER, AND THE BOOK ITSELF, CLOSES WITH AN ASSESSMENT OF THE MOST SIGNIFICANT ASPECTS THAT THOSE INVOLVED IN POLICY AND PRACTICE, AS WELL AS FUTURE RESEARCHERS, SHOULD TAKE INTO ACCOUNT.

INTRODUCTION TO MATHEMATICAL BIOLOGY CHING SHAN CHOU 2016-04-27 THIS BOOK IS BASED ON A ONE SEMESTER COURSE THAT THE AUTHORS HAVE BEEN TEACHING FOR SEVERAL YEARS, AND INCLUDES TWO SETS OF CASE STUDIES. THE FIRST INCLUDES CHEMOSTAT MODELS, PREDATOR-PREY INTERACTION, COMPETITION AMONG SPECIES, THE SPREAD OF INFECTIOUS DISEASES, AND OSCILLATIONS ARISING FROM BIFURCATIONS. IN DEVELOPING THESE TOPICS, READERS WILL ALSO BE INTRODUCED TO THE BASIC THEORY OF ORDINARY DIFFERENTIAL EQUATIONS, AND HOW TO WORK WITH MATLAB WITHOUT HAVING ANY PRIOR PROGRAMMING EXPERIENCE. THE SECOND SET OF CASE STUDIES WERE ADAPTED FROM RECENT AND CURRENT RESEARCH PAPERS TO THE LEVEL OF THE STUDENTS. TOPICS HAVE BEEN SELECTED BASED ON PUBLIC HEALTH INTEREST. THIS INCLUDES THE RISK OF ATHEROSCLEROSIS ASSOCIATED WITH HIGH CHOLESTEROL LEVELS, CANCER AND IMMUNE INTERACTIONS, CANCER THERAPY, AND TUBERCULOSIS. READERS WILL EXPERIENCE HOW MATHEMATICAL MODELS AND THEIR NUMERICAL SIMULATIONS CAN PROVIDE EXPLANATIONS THAT GUIDE BIOLOGICAL AND BIOMEDICAL RESEARCH. CONSIDERED TO BE THE UNDERGRADUATE COMPANION TO THE MORE ADVANCED BOOK “MATHEMATICAL MODELING OF BIOLOGICAL PROCESSES” (A. FRIEDMAN, C.-Y. KAO, SPRINGER - 2014), THIS BOOK IS GEARED TOWARDS UNDERGRADUATE STUDENTS WITH LITTLE BACKGROUND IN MATHEMATICS AND NO BIOLOGICAL BACKGROUND.

THE MATHEMATICS AND MECHANICS OF BIOLOGICAL GROWTH ALAIN GORIELY 2017-05-29 THIS MONOGRAPH PRESENTS A GENERAL MATHEMATICAL THEORY FOR BIOLOGICAL GROWTH. IT PROVIDES BOTH A CONCEPTUAL AND A TECHNICAL FOUNDATION FOR THE UNDERSTANDING AND ANALYSIS OF PROBLEMS ARISING IN BIOLOGY AND PHYSIOLOGY. THE THEORY AND METHODS ARE ILLUSTRATED ON A WIDE RANGE OF EXAMPLES AND APPLICATIONS. A PROCESS OF EXTREME COMPLEXITY, GROWTH PLAYS A FUNDAMENTAL ROLE IN MANY BIOLOGICAL PROCESSES AND IS CONSIDERED TO BE THE HALLMARK OF LIFE ITSELF. ITS DESCRIPTION HAS BEEN ONE OF THE FUNDAMENTAL PROBLEMS OF LIFE SCIENCES, BUT UNTIL RECENTLY, IT HAS NOT ATTRACTED MUCH ATTENTION FROM MATHEMATICIANS, PHYSICISTS, AND ENGINEERS. THE AUTHOR HEREIN PRESENTS THE FIRST MAJOR TECHNICAL MONOGRAPH ON THE PROBLEM OF GROWTH SINCE D'ARCY WENTWORTH THOMPSON'S 1917 BOOK ON GROWTH AND FORM. THE EMPHASIS OF THE BOOK IS ON THE PROPER MATHEMATICAL FORMULATION OF GROWTH KINEMATICS AND MECHANICS. ACCORDINGLY, THE DISCUSSION PROCEEDS IN ORDER OF COMPLEXITY AND THE BOOK IS DIVIDED INTO FIVE PARTS. FIRST, A GENERAL INTRODUCTION ON THE PROBLEM OF GROWTH FROM A HISTORICAL PERSPECTIVE IS GIVEN. THEN, BASIC CONCEPTS ARE INTRODUCED WITHIN THE CONTEXT OF GROWTH IN FILAMENTARY STRUCTURES. THESE IDEAS ARE THEN GENERALIZED TO SURFACES AND MEMBRANES AND EVENTUALLY TO THE GENERAL CASE OF VOLUMETRIC GROWTH. THE BOOK CONCLUDES WITH A DISCUSSION OF OPEN PROBLEMS AND OUTSTANDING CHALLENGES. THOUGHTFULLY WRITTEN AND RICHLY ILLUSTRATED TO BE ACCESSIBLE TO READERS OF VARYING INTERESTS AND BACKGROUND, THE TEXT WILL APPEAL TO LIFE SCIENTISTS, BIOPHYSICISTS, BIOMEDICAL ENGINEERS, AND APPLIED MATHEMATICIANS ALIKE.

NONLINEAR DYNAMICS IN PHYSIOLOGY AND MEDICINE ANNE BEUTER 2013-06-05 INTRODUCES CONCEPTS FROM NONLINEAR DYNAMICS USING AN ALMOST EXCLUSIVELY BIOLOGICAL SETTING FOR MOTIVATION, AND INCLUDES EXAMPLES OF HOW THESE CONCEPTS ARE USED IN EXPERIMENTAL INVESTIGATIONS OF BIOLOGICAL AND PHYSIOLOGICAL SYSTEMS. ONE NOVEL FEATURE OF THE BOOK IS THE INCLUSION OF CLASSROOM-TESTED COMPUTER EXERCISES. THIS BOOK WILL APPEAL TO STUDENTS AND RESEARCHERS WORKING IN THE NATURAL AND PHYSICAL SCIENCES WANTING TO LEARN ABOUT PHYSIOLOGICAL SYSTEMS FROM A MATHEMATICAL PERSPECTIVE.

A COURSE IN MATHEMATICAL BIOLOGY GERDA DE VRIES 2006-07-01 THIS IS THE ONLY BOOK THAT TEACHES ALL ASPECTS OF MODERN MATHEMATICAL MODELING AND THAT IS SPECIFICALLY DESIGNED TO INTRODUCE UNDERGRADUATE STUDENTS TO PROBLEM

SOLVING IN THE CONTEXT OF BIOLOGY. INCLUDED IS AN INTEGRATED PACKAGE OF THEORETICAL MODELING AND ANALYSIS TOOLS, COMPUTATIONAL MODELING TECHNIQUES, AND PARAMETER ESTIMATION AND MODEL VALIDATION METHODS, WITH A FOCUS ON INTEGRATING ANALYTICAL AND COMPUTATIONAL TOOLS IN THE MODELING OF BIOLOGICAL PROCESSES. DIVIDED INTO THREE PARTS, IT COVERS BASIC ANALYTICAL MODELING TECHNIQUES; INTRODUCES COMPUTATIONAL TOOLS USED IN THE MODELING OF BIOLOGICAL PROBLEMS; AND INCLUDES VARIOUS PROBLEMS FROM EPIDEMIOLOGY, ECOLOGY, AND PHYSIOLOGY. ALL CHAPTERS INCLUDE REALISTIC BIOLOGICAL EXAMPLES, INCLUDING MANY EXERCISES RELATED TO BIOLOGICAL QUESTIONS. IN ADDITION, 25 OPEN-ENDED RESEARCH PROJECTS ARE PROVIDED, SUITABLE FOR STUDENTS. AN ACCOMPANYING WEB SITE CONTAINS SOLUTIONS AND A TUTORIAL FOR THE IMPLEMENTATION OF THE COMPUTATIONAL MODELING TECHNIQUES. CALCULATIONS CAN BE DONE IN MODERN COMPUTING LANGUAGES SUCH AS MAPLE, MATHEMATICA, AND MATLAB.

INTRODUCTION TO MATHEMATICAL ONCOLOGY YANG KUANG 2016-04-05 INTRODUCTION TO MATHEMATICAL ONCOLOGY PRESENTS BIOLOGICALLY WELL-MOTIVATED AND MATHEMATICALLY TRACTABLE MODELS THAT FACILITATE BOTH A DEEP UNDERSTANDING OF CANCER BIOLOGY AND BETTER CANCER TREATMENT DESIGNS. IT COVERS THE MEDICAL AND BIOLOGICAL BACKGROUND OF THE DISEASES, MODELING ISSUES, AND EXISTING METHODS AND THEIR LIMITATIONS. THE AUTHORS INTRODUCE MATHEMATICAL AND PROGRAMMING TOOLS, ALONG WITH ANALYTICAL AND NUMERICAL STUDIES OF THE MODELS. THEY ALSO DEVELOP NEW MATHEMATICAL TOOLS AND LOOK TO FUTURE IMPROVEMENTS ON DYNAMICAL MODELS. AFTER INTRODUCING THE GENERAL THEORY OF MEDICINE AND EXPLORING HOW MATHEMATICS CAN BE ESSENTIAL IN ITS UNDERSTANDING, THE TEXT DESCRIBES WELL-KNOWN, PRACTICAL, AND INSIGHTFUL MATHEMATICAL MODELS OF AVASCULAR TUMOR GROWTH AND MATHEMATICALLY TRACTABLE TREATMENT MODELS BASED ON ORDINARY DIFFERENTIAL EQUATIONS. IT CONTINUES THE TOPIC OF AVASCULAR TUMOR GROWTH IN THE CONTEXT OF PARTIAL DIFFERENTIAL EQUATION MODELS BY INCORPORATING THE SPATIAL STRUCTURE AND PHYSIOLOGICAL STRUCTURE, SUCH AS CELL SIZE. THE BOOK THEN FOCUSES ON THE RECENT ACTIVE MULTI-SCALE MODELING EFFORTS ON PROSTATE CANCER GROWTH AND TREATMENT DYNAMICS. IT ALSO EXAMINES MORE MECHANISTICALLY FORMULATED MODELS, INCLUDING CELL QUOTA-BASED POPULATION GROWTH MODELS, WITH APPLICATIONS TO REAL TUMORS AND VALIDATION USING CLINICAL DATA. THE REMAINDER OF THE TEXT PRESENTS ABUNDANT ADDITIONAL HISTORICAL, BIOLOGICAL, AND MEDICAL BACKGROUND MATERIALS FOR ADVANCED AND SPECIFIC TREATMENT MODELING EFFORTS. EXTENSIVELY CLASSROOM-TESTED IN UNDERGRADUATE AND GRADUATE COURSES, THIS SELF-CONTAINED BOOK ALLOWS INSTRUCTORS TO EMPHASIZE SPECIFIC TOPICS RELEVANT TO CLINICAL CANCER BIOLOGY AND TREATMENT. IT CAN BE USED IN A VARIETY OF WAYS, INCLUDING A SINGLE-SEMESTER UNDERGRADUATE COURSE, A MORE AMBITIOUS GRADUATE COURSE, OR A FULL-YEAR SEQUENCE ON MATHEMATICAL ONCOLOGY.

BIO2010 NATIONAL RESEARCH COUNCIL 2003-02-13 BIOLOGICAL SCIENCES HAVE BEEN REVOLUTIONIZED, NOT ONLY IN THE WAY RESEARCH IS CONDUCTED -- WITH THE INTRODUCTION OF TECHNIQUES SUCH AS RECOMBINANT DNA AND DIGITAL TECHNOLOGY -- BUT ALSO IN HOW RESEARCH FINDINGS ARE COMMUNICATED AMONG PROFESSIONALS AND TO THE PUBLIC. YET, THE UNDERGRADUATE PROGRAMS THAT TRAIN BIOLOGY RESEARCHERS REMAIN MUCH THE SAME AS THEY WERE BEFORE THESE FUNDAMENTAL CHANGES CAME ON THE SCENE. THIS NEW VOLUME PROVIDES A BLUEPRINT FOR BRINGING UNDERGRADUATE BIOLOGY EDUCATION UP TO THE SPEED OF TODAY'S RESEARCH FAST TRACK. IT INCLUDES RECOMMENDATIONS FOR TEACHING THE NEXT GENERATION OF LIFE SCIENCE INVESTIGATORS, THROUGH: BUILDING A STRONG INTERDISCIPLINARY CURRICULUM THAT INCLUDES PHYSICAL SCIENCE, INFORMATION TECHNOLOGY, AND MATHEMATICS. ELIMINATING THE ADMINISTRATIVE AND FINANCIAL BARRIERS TO CROSS-DEPARTMENTAL COLLABORATION. EVALUATING THE IMPACT OF MEDICAL COLLEGE ADMISSIONS TESTING ON UNDERGRADUATE BIOLOGY EDUCATION. CREATING EARLY OPPORTUNITIES FOR INDEPENDENT RESEARCH. DESIGNING MEANINGFUL LABORATORY EXPERIENCES INTO THE CURRICULUM. THE COMMITTEE PRESENTS A DOZEN BRIEF CASE STUDIES OF EXEMPLARY PROGRAMS AT LEADING INSTITUTIONS AND LISTS MANY RESOURCES FOR BIOLOGY EDUCATORS. THIS VOLUME WILL BE IMPORTANT TO BIOLOGY FACULTY, ADMINISTRATORS, PRACTITIONERS, PROFESSIONAL SOCIETIES, RESEARCH AND EDUCATION FUNDERS, AND THE BIOTECHNOLOGY INDUSTRY.

KILLER CELL DYNAMICS DOMINIK WODARZ 2007-04-05 THIS BOOK REVIEWS HOW MATHEMATICAL AND COMPUTATIONAL APPROACHES CAN BE USEFUL TO HELP US UNDERSTAND HOW KILLER T-CELL RESPONSES WORK TO FIGHT VIRAL INFECTIONS. IT ALSO DEMONSTRATES, IN A WRITING STYLE THAT EXEMPLIFIES THE POINT, THAT SUCH MATHEMATICAL AND COMPUTATIONAL APPROACHES ARE MOST VALUABLE WHEN COUPLED WITH EXPERIMENTAL WORK THROUGH INTERDISCIPLINARY COLLABORATIONS. DESIGNED TO BE USEFUL TO IMMUNOLOGISTS AND VIROLOGISTS WITHOUT EXTENSIVE COMPUTATIONAL BACKGROUND, THE BOOK COVERS A BROAD VARIETY OF TOPICS, INCLUDING BOTH BASIC IMMUNOLOGICAL QUESTIONS AND THE APPLICATION OF THESE INSIGHTS TO THE UNDERSTANDING AND TREATMENT OF PATHOGENIC HUMAN DISEASES.

INTRODUCTION TO COMPUTATIONAL BIOLOGY MICHAEL S. WATERMAN 2018-05-02 BIOLOGY IS IN THE MIDST OF A ERA YIELDING MANY SIGNIFICANT DISCOVERIES AND PROMISING MANY MORE. UNIQUE TO THIS ERA IS THE EXPONENTIAL GROWTH IN THE SIZE OF INFORMATION-PACKED DATABASES. INSPIRED BY A PRESSING NEED TO ANALYZE THAT DATA, INTRODUCTION TO COMPUTATIONAL

BIOLOGY EXPLORES A NEW AREA OF EXPERTISE THAT EMERGED FROM THIS FERTILE FIELD— THE COMBINATION OF BIOLOGICAL AND INFORMATION SCIENCES. THIS INTRODUCTION DESCRIBES THE MATHEMATICAL STRUCTURE OF BIOLOGICAL DATA, ESPECIALLY FROM SEQUENCES AND CHROMOSOMES. AFTER A BRIEF SURVEY OF MOLECULAR BIOLOGY, IT STUDIES RESTRICTION MAPS OF DNA, ROUGH LANDMARK MAPS OF THE UNDERLYING SEQUENCES, AND CLONES AND CLONE MAPS. IT EXAMINES PROBLEMS ASSOCIATED WITH READING DNA SEQUENCES AND COMPARING SEQUENCES TO FINDING COMMON PATTERNS. THE AUTHOR THEN CONSIDERS THAT STATISTICS OF PATTERN COUNTS IN SEQUENCES, RNA SECONDARY STRUCTURE, AND THE INFERENCE OF EVOLUTIONARY HISTORY OF RELATED SEQUENCES. INTRODUCTION TO COMPUTATIONAL BIOLOGY EXPOSES THE READER TO THE FASCINATING STRUCTURE OF BIOLOGICAL DATA AND EXPLAINS HOW TO TREAT RELATED COMBINATORIAL AND STATISTICAL PROBLEMS. WRITTEN TO DESCRIBE MATHEMATICAL FORMULATION AND DEVELOPMENT, THIS BOOK HELPS SET THE STAGE FOR EVEN MORE, TRULY INTERDISCIPLINARY WORK IN BIOLOGY.

CALCULUS FOR THE LIFE SCIENCES: A MODELING APPROACH JAMES L. CORNETTE 2019-05-25 CALCULUS FOR THE LIFE SCIENCES IS AN ENTIRE REIMAGINING OF THE STANDARD CALCULUS SEQUENCE WITH THE NEEDS OF LIFE SCIENCE STUDENTS AS THE FUNDAMENTAL ORGANIZING PRINCIPLE. THOSE NEEDS, ACCORDING TO THE NATIONAL ACADEMY OF SCIENCE, INCLUDE: THE MATHEMATICAL CONCEPTS OF CHANGE, MODELING, EQUILIBRIA AND STABILITY, STRUCTURE OF A SYSTEM, INTERACTIONS AMONG COMPONENTS, DATA AND MEASUREMENT, VISUALIZATION, AND ALGORITHMS. THIS BOOK ADDRESSES, IN A DEEP AND SIGNIFICANT WAY, EVERY CONCEPT ON THAT LIST. THE BOOK BEGINS WITH A PRIMER ON MODELING IN THE BIOLOGICAL REALM AND BIOLOGICAL MODELING IS THE THEME AND FRAME FOR THE ENTIRE BOOK. THE AUTHORS BUILD MODELS OF BACTERIAL GROWTH, LIGHT PENETRATION THROUGH A COLUMN OF WATER, AND DYNAMICS OF A COLONY OF MOLD IN THE FIRST FEW PAGES. IN EACH CASE THERE IS ACTUAL DATA THAT NEEDS FITTING. IN THE CASE OF THE MOLD COLONY THAT DATA IS A SET OF PHOTOGRAPHS OF THE COLONY GROWING ON A RULED SHEET OF GRAPH PAPER AND THE STUDENTS NEED TO MAKE THEIR OWN APPROXIMATIONS. FUNDAMENTAL QUESTIONS ABOUT THE NATURE OF MATHEMATICAL MODELING—TRYING TO APPROXIMATE A REAL-WORLD PHENOMENON WITH AN EQUATION—ARE ALL LAID OUT FOR THE STUDENTS TO WRESTLE WITH. THE AUTHORS HAVE PRODUCED A BEAUTIFULLY WRITTEN INTRODUCTION TO THE USES OF MATHEMATICS IN THE LIFE SCIENCES. THE EXPOSITION IS CRYSTALLINE, THE PROBLEMS ARE OVERWHELMINGLY FROM BIOLOGY AND INTERESTING AND RICH, AND THE EMPHASIS ON MODELING IS PERVASIVE. AN INSTRUCTOR'S MANUAL FOR THIS TITLE IS AVAILABLE ELECTRONICALLY TO THOSE INSTRUCTORS WHO HAVE ADOPTED THE TEXTBOOK FOR CLASSROOM USE. PLEASE SEND EMAIL TO TEXTBOOKS@TAMS.ORG FOR MORE INFORMATION. ONLINE QUESTION CONTENT AND INTERACTIVE STEP-BY-STEP TUTORIALS ARE AVAILABLE FOR THIS TITLE IN WEBASSIGN. WEBASSIGN IS A LEADING PROVIDER OF ONLINE INSTRUCTIONAL TOOLS FOR BOTH FACULTY AND STUDENTS.

MATHEMATICAL BIOLOGY II JAMES D. MURRAY 2011-02-15 THIS RICHLY ILLUSTRATED THIRD EDITION PROVIDES A THOROUGH TRAINING IN PRACTICAL MATHEMATICAL BIOLOGY AND SHOWS HOW EXCITING MATHEMATICAL CHALLENGES CAN ARISE FROM A GENUINELY INTERDISCIPLINARY INVOLVEMENT WITH THE BIOSCIENCES. IT HAS BEEN EXTENSIVELY UPDATED AND EXTENDED TO COVER MUCH OF THE GROWTH OF MATHEMATICAL BIOLOGY. FROM THE REVIEWS: "THIS BOOK, A CLASSICAL TEXT IN MATHEMATICAL BIOLOGY, CLEVERLY COMBINES MATHEMATICAL TOOLS WITH SUBJECT AREA SCIENCES."--SHORT BOOK REVIEWS

MATHEMATICAL MODELS IN BIOLOGY LEAH EDELSTEIN-KESHET 1988-01-01 MATHEMATICAL MODELS IN BIOLOGY IS AN INTRODUCTORY BOOK FOR READERS INTERESTED IN BIOLOGICAL APPLICATIONS OF MATHEMATICS AND MODELING IN BIOLOGY. A FAVORITE IN THE MATHEMATICAL BIOLOGY COMMUNITY, IT SHOWS HOW RELATIVELY SIMPLE MATHEMATICS CAN BE APPLIED TO A VARIETY OF MODELS TO DRAW INTERESTING CONCLUSIONS. CONNECTIONS ARE MADE BETWEEN DIVERSE BIOLOGICAL EXAMPLES LINKED BY COMMON MATHEMATICAL THEMES. A VARIETY OF DISCRETE AND CONTINUOUS ORDINARY AND PARTIAL DIFFERENTIAL EQUATION MODELS ARE EXPLORED. ALTHOUGH GREAT ADVANCES HAVE TAKEN PLACE IN MANY OF THE TOPICS COVERED, THE SIMPLE LESSONS CONTAINED IN THIS BOOK ARE STILL IMPORTANT AND INFORMATIVE. AUDIENCE: THE BOOK DOES NOT ASSUME TOO MUCH BACKGROUND KNOWLEDGE--ESSENTIALLY SOME CALCULUS AND HIGH-SCHOOL ALGEBRA. IT WAS ORIGINALLY WRITTEN WITH THIRD- AND FOURTH-YEAR UNDERGRADUATE MATHEMATICAL-BIOLOGY MAJORS IN MIND; HOWEVER, IT WAS PICKED UP BY BEGINNING GRADUATE STUDENTS AS WELL AS RESEARCHERS IN MATH (AND SOME IN BIOLOGY) WHO WANTED TO LEARN ABOUT THIS FIELD.

MATHEMATICAL PHYSIOLOGY JAMES KEENER 2010-06-04 DIVIDED INTO TWO VOLUMES, THE BOOK BEGINS WITH A PEDAGOGICAL PRESENTATION OF SOME OF THE BASIC THEORY, WITH CHAPTERS ON BIOCHEMICAL REACTIONS, DIFFUSION, EXCITABILITY, WAVE PROPAGATION AND CELLULAR HOMEOSTASIS. THE SECOND, MORE EXTENSIVE PART DISCUSSES PARTICULAR PHYSIOLOGICAL SYSTEMS, WITH CHAPTERS ON CALCIUM DYNAMICS, BURSTING OSCILLATIONS AND SECRETION, CARDIAC CELLS, MUSCLES, INTERCELLULAR COMMUNICATION, THE CIRCULATORY SYSTEM, THE IMMUNE SYSTEM, WOUND HEALING, THE RESPIRATORY SYSTEM, THE VISUAL SYSTEM, HORMONE PHYSIOLOGY, RENAL PHYSIOLOGY, DIGESTION, THE VISUAL SYSTEM AND HEARING. NEW CHAPTERS ON CALCIUM DYNAMICS, NEUROENDOCRINE CELLS AND REGULATION OF CELL FUNCTION HAVE BEEN INCLUDED. REVIEWS FROM FIRST EDITION: KEENER AND SNEYD'S MATHEMATICAL PHYSIOLOGY IS THE FIRST COMPREHENSIVE TEXT OF ITS KIND THAT DEALS EXCLUSIVELY WITH THE INTERPLAY BETWEEN MATHEMATICS AND PHYSIOLOGY. WRITING A BOOK LIKE THIS IS AN AUDACIOUS ACT! -

SOCIETY OF MATHEMATICAL BIOLOGY KEENER AND SNEYD'S IS UNIQUE IN THAT IT ATTEMPTS TO PRESENT ONE OF THE MOST IMPORTANT SUBFIELDS OF BIOLOGY AND MEDICINE, PHYSIOLOGY, IN TERMS OF MATHEMATICAL "LANGUAGE", RATHER THAN ORGANIZING MATERIALS AROUND MATHEMATICAL METHODOLOGY. -SIAM REVIEW

EXPLORATIONS OF MATHEMATICAL MODELS IN BIOLOGY WITH MATLAB MAZEN SHAHIN 2013-12-24 EXPLORE AND ANALYZE THE SOLUTIONS OF MATHEMATICAL MODELS FROM DIVERSE DISCIPLINES AS BIOLOGY INCREASINGLY DEPENDS ON DATA, ALGORITHMS, AND MODELS, IT HAS BECOME NECESSARY TO USE A COMPUTING LANGUAGE, SUCH AS THE USER-FRIENDLY MATLAB, TO FOCUS MORE ON BUILDING AND ANALYZING MODELS AS OPPOSED TO CONFIGURING TEDIOUS CALCULATIONS. EXPLORATIONS OF MATHEMATICAL MODELS IN BIOLOGY WITH MATLAB PROVIDES AN INTRODUCTION TO MODEL CREATION USING MATLAB, FOLLOWED BY THE TRANSLATION, ANALYSIS, INTERPRETATION, AND OBSERVATION OF THE MODELS. WITH AN INTEGRATED AND INTERDISCIPLINARY APPROACH THAT EMBEDS MATHEMATICAL MODELING INTO BIOLOGICAL APPLICATIONS, THE BOOK ILLUSTRATES NUMEROUS APPLICATIONS OF MATHEMATICAL TECHNIQUES WITHIN BIOLOGY, ECOLOGY, AND ENVIRONMENTAL SCIENCES. FEATURING A QUANTITATIVE, COMPUTATIONAL, AND MATHEMATICAL APPROACH, THE BOOK INCLUDES: EXAMPLES OF REAL-WORLD APPLICATIONS, SUCH AS POPULATION DYNAMICS, GENETICS, DRUG ADMINISTRATION, INTERACTING SPECIES, AND THE SPREAD OF CONTAGIOUS DISEASES, TO SHOWCASE THE RELEVANCY AND WIDE APPLICABILITY OF ABSTRACT MATHEMATICAL TECHNIQUES DISCUSSION OF VARIOUS MATHEMATICAL CONCEPTS, SUCH AS MARKOV CHAINS, MATRIX ALGEBRA, EIGENVALUES, EIGENVECTORS, FIRST-ORDER LINEAR DIFFERENCE EQUATIONS, AND NONLINEAR FIRST-ORDER DIFFERENCE EQUATIONS COVERAGE OF DIFFERENCE EQUATIONS TO MODEL A WIDE RANGE OF REAL-LIFE DISCRETE TIME SITUATIONS IN DIVERSE AREAS AS WELL AS DISCUSSIONS ON MATRICES TO MODEL LINEAR PROBLEMS SOLUTIONS TO SELECTED EXERCISES AND ADDITIONAL MATLAB CODES EXPLORATIONS OF MATHEMATICAL MODELS IN BIOLOGY WITH MATLAB IS AN IDEAL TEXTBOOK FOR UPPER-UNDERGRADUATE COURSES IN MATHEMATICAL MODELS IN BIOLOGY, THEORETICAL ECOLOGY, BIOECONOMICS, FORENSIC SCIENCE, APPLIED MATHEMATICS, AND ENVIRONMENTAL SCIENCE. THE BOOK IS ALSO AN EXCELLENT REFERENCE FOR BIOLOGISTS, ECOLOGISTS, MATHEMATICIANS, BIOMATHEMATICIANS, AND ENVIRONMENTAL AND RESOURCE ECONOMISTS.

ESSENTIAL MATHEMATICAL BIOLOGY NICHOLAS F. BRITTON 2012-12-06 THIS SELF-CONTAINED INTRODUCTION TO THE FAST-GROWING FIELD OF MATHEMATICAL BIOLOGY IS WRITTEN FOR STUDENTS WITH A MATHEMATICAL BACKGROUND. IT SETS THE SUBJECT IN A HISTORICAL CONTEXT AND GUIDES THE READER TOWARDS QUESTIONS OF CURRENT RESEARCH INTEREST. A BROAD RANGE OF TOPICS IS COVERED INCLUDING: POPULATION DYNAMICS, INFECTIOUS DISEASES, POPULATION GENETICS AND EVOLUTION, DISPERSAL, MOLECULAR AND CELLULAR BIOLOGY, PATTERN FORMATION, AND CANCER MODELLING. PARTICULAR ATTENTION IS PAID TO SITUATIONS WHERE THE SIMPLE ASSUMPTIONS OF HOMOGENITY MADE IN EARLY MODELS BREAK DOWN AND THE PROCESS OF MATHEMATICAL MODELLING IS SEEN IN ACTION.

COMPUTATIONAL CELL BIOLOGY CHRISTOPHER P. FALL 2007-06-04 THIS TEXTBOOK PROVIDES AN INTRODUCTION TO DYNAMIC MODELING IN MOLECULAR CELL BIOLOGY, TAKING A COMPUTATIONAL AND INTUITIVE APPROACH. DETAILED ILLUSTRATIONS, EXAMPLES, AND EXERCISES ARE INCLUDED THROUGHOUT THE TEXT. APPENDICES CONTAINING MATHEMATICAL AND COMPUTATIONAL TECHNIQUES ARE PROVIDED AS A REFERENCE TOOL.

TOPICS IN MATHEMATICAL BIOLOGY KARL PETER HADELER 2017-12-20 THIS BOOK ANALYZES THE IMPACT OF QUIESCENT PHASES ON BIOLOGICAL MODELS. QUIESCENCE ARISES, FOR EXAMPLE, WHEN MOVING INDIVIDUALS STOP MOVING, HUNTING PREDATORS TAKE A REST, INFECTED INDIVIDUALS ARE ISOLATED, OR CELLS ENTER THE QUIESCENT COMPARTMENT OF THE CELL CYCLE. IN THE FIRST CHAPTER OF TOPICS IN MATHEMATICAL BIOLOGY GENERAL PRINCIPLES ABOUT COUPLED AND QUIESCENT SYSTEMS ARE DERIVED, INCLUDING RESULTS ON SHRINKING PERIODIC ORBITS AND STABILIZATION OF OSCILLATIONS VIA QUIESCENCE. IN SUBSEQUENT CHAPTERS CLASSICAL BIOLOGICAL MODELS ARE PRESENTED IN DETAIL AND CHALLENGED BY THE INTRODUCTION OF QUIESCENCE. THESE MODELS INCLUDE DELAY EQUATIONS, DEMOGRAPHIC MODELS, AGE STRUCTURED MODELS, LOTKA-VOLTERRA SYSTEMS, REPLICATOR SYSTEMS, GENETIC MODELS, GAME THEORY, NASH EQUILIBRIA, EVOLUTIONARY STABLE STRATEGIES, ECOLOGICAL MODELS, EPIDEMIOLOGICAL MODELS, RANDOM WALKS AND REACTION-DIFFUSION MODELS. IN EACH CASE WE FIND NEW AND INTERESTING RESULTS SUCH AS STABILITY OF FIXED POINTS AND/OR PERIODIC ORBITS, EXCITABILITY OF STEADY STATES, EPIDEMIC OUTBREAKS, SURVIVAL OF THE FITTEST, AND SPEEDS OF INVADING FRONTS. THE TEXTBOOK IS INTENDED FOR GRADUATE STUDENTS AND RESEARCHERS IN MATHEMATICAL BIOLOGY WHO HAVE A SOLID BACKGROUND IN LINEAR ALGEBRA, DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEMS. READERS CAN FIND GEMS OF UNEXPECTED BEAUTY WITHIN THESE PAGES, AND THOSE WHO KNEW K.P. (AS HE WAS OFTEN CALLED) WILL LIKELY FEEL HIS PRESENCE AND HEAR HIM SPEAKING TO THEM AS THEY READ.

MATHEMATICAL BIOLOGY JAMES D. MURRAY 2007-06-12 MATHEMATICAL BIOLOGY IS A RICHLY ILLUSTRATED TEXTBOOK IN AN EXCITING AND FAST GROWING FIELD. PROVIDING AN IN-DEPTH LOOK AT THE PRACTICAL USE OF MATH MODELING, IT FEATURES EXERCISES THROUGHOUT THAT ARE DRAWN FROM A VARIETY OF BIOSCIENTIFIC DISCIPLINES - POPULATION BIOLOGY,

DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, EPIDEMIOLOGY, AND EVOLUTION, AMONG OTHERS. IT MAINTAINS A CONSISTENT LEVEL THROUGHOUT SO THAT GRADUATE STUDENTS CAN USE IT TO GAIN A Foothold INTO THIS DYNAMIC RESEARCH AREA.

EXPLORING MATHEMATICAL MODELING IN BIOLOGY THROUGH CASE STUDIES AND EXPERIMENTAL ACTIVITIES REBECCA SANFT
2020-03-30 EXPLORING MATHEMATICAL MODELING IN BIOLOGY THROUGH CASE STUDIES AND EXPERIMENTAL ACTIVITIES
PROVIDES SUPPORTING MATERIALS FOR COURSES TAKEN BY STUDENTS MAJORING IN MATHEMATICS, COMPUTER SCIENCE OR IN THE LIFE SCIENCES. THE BOOK'S CASES AND LAB EXERCISES FOCUS ON HYPOTHESIS TESTING AND MODEL DEVELOPMENT IN THE CONTEXT OF REAL DATA. THE SUPPORTING MATHEMATICAL, CODING AND BIOLOGICAL BACKGROUND PERMIT READERS TO EXPLORE A PROBLEM, UNDERSTAND ASSUMPTIONS, AND THE MEANING OF THEIR RESULTS. THE EXPERIENTIAL COMPONENTS PROVIDE HANDS-ON LEARNING BOTH IN THE LAB AND ON THE COMPUTER. AS A BEGINNING TEXT IN MODELING, READERS WILL LEARN TO VALUE THE APPROACH AND APPLY COMPETENCIES IN OTHER SETTINGS. INCLUDED CASE STUDIES FOCUS ON BUILDING A MODEL TO SOLVE A PARTICULAR BIOLOGICAL PROBLEM FROM CONCEPT AND TRANSLATION INTO A MATHEMATICAL FORM, TO VALIDATING THE PARAMETERS, TESTING THE QUALITY OF THE MODEL AND FINALLY INTERPRETING THE OUTCOME IN BIOLOGICAL TERMS. THE BOOK ALSO SHOWS HOW PARTICULAR MATHEMATICAL APPROACHES ARE ADAPTED TO A VARIETY OF PROBLEMS AT MULTIPLE BIOLOGICAL SCALES. FINALLY, THE LABS BRING THE BIOLOGICAL PROBLEMS AND THE PRACTICAL ISSUES OF COLLECTING DATA TO ACTUALLY TEST THE MODEL AND/OR ADAPTING THE MATHEMATICS TO THE DATA THAT CAN BE COLLECTED. PRESENTS A SINGLE VOLUME ON MATHEMATICS AND BIOLOGICAL EXAMPLES, WITH DATA AND WET LAB EXPERIENCES SUITABLE FOR NON-EXPERTS CONTAINS THREE REAL-WORLD BIOLOGICAL CASE STUDIES AND ONE WET LAB FOR APPLICATION OF THE MATHEMATICAL MODELS INCLUDES R CODE TEMPLATES THROUGHOUT THE TEXT, WHICH ARE ALSO AVAILABLE THROUGH AN ONLINE REPOSITORY, ALONG WITH THE NECESSARY DATA FILES TO COMPLETE ALL PROJECTS AND LABS