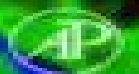


GREEN FLUORESCENT PROTEINS

A fluorescence microscopy image showing several cells. The nuclei are stained blue, and the cytoplasm and some organelles are stained green. The background is black.

Edited by
Kevin F. Sullivan
Steve A. Kay



Green Fluorescent Proteins Book

Barry W. Hicks



Green Fluorescent Proteins Book:

Green Fluorescent Proteins ,1998-10-07 This volume is an authoritative and comprehensive treatment of the approaches and techniques used for Green Fluorescent Proteins GFP The primary focus of this work is on research using biological systems The volume covers all aspects of GFP from its expression in different organisms to specific microscopic and data analysis methods Key Features Only volume on Green Fluorescent Protein research Covers all aspects of GFP Provides specific microscopic and data analysis methods Discusses the design and construction of GFP fusion proteins Covers GFP expression in animals insects plants and microbes Details procedures for time lapse imaging of living cells Explains how to implement single molecule fluorescence detection with GFP Discusses dual label GFP strategies for multicolor fluorescence Presents fluorescence resonance energy transfer methods with GFPs Details quantitative fluorescence imaging techniques Extensively illustrated with color photographs

Illuminating Disease Marc Zimmer,2015-01-05 Green fluorescent proteins have been floating in the ocean for more than 160 million years but it took a curious scientist fascinated by pinpricks of green light to begin unlocking their potential Now these jellyfish proteins have become one of the most important tools available to researchers in modern medicine and biology By using them to illuminate other proteins that were previously invisible even under a microscope scientists are now able to observe facets of disease that would have otherwise gone undetected Green fluorescent proteins are used in over three million experiments a year and have proved invaluable for tasks such as tracking HIV breeding bird flu resistant chickens and confirming the existence of cancerous stem cells In Illuminating Disease Marc Zimmer introduces us to these revolutionary proteins acquainting readers both with the researchers responsible for the proteins discovery as well as their wide utility The book details the history of genetically modified fluorescent parasites and viruses which provide scientists with lifesaving information about the spread of diseases Green fluorescent proteins allow scientists and doctors to understand diseases better by quite literally illuminating various microscopic interactions occurring in living cells that otherwise would have gone unseen The book is richly illustrated showing the visually striking uses of green fluorescent proteins and many of these scans have won awards in biological imaging competitions An ideal introduction for students and advanced researchers alike Illuminating Disease is an accessible yet deeply probing investigation into one of the most important developments in medical research of the last several decades

Green Fluorescent Protein Martin Chalfie,Steven R. Kain,2005-12-13 Since the discovery of the gene for green fluorescent protein GFP derived from jellyfish this protein that emits a green glow has initiated a revolution in molecular biosciences With this tool it is now possible to visualize nearly any protein of interest in any cell or tissue of any species Since the publication of the first edition there have been tremendously significant technological advances including development of new mutant variants Proteins are now available in yellow and blue and Novel Fluorescent Proteins NFPs have expanded their utility in developing biosensors biological markers and other biological applications This updated expanded new edition

places emphasis on the rise of NFPs including new chapters on NFP properties with detailed protocols applications of GFPs and NFPs in industry research and biosensors This book provides a solid theoretical framework along with detailed practical guidance on use of GFPs and NFPs with discussion of potential pitfalls The expert contributors provide real examples in showing how to tailor GFP NFP to specific systems maximize expression and enhance detection

Green Fluorescent Protein P. Michael Conn, 1999-04-02 One of the most important recent discoveries in science is the green fluorescent protein isolated from a bioluminescent jellyfish The gene that codes for this protein is active in any type of cell from microbes to humans producing a day glo dye visible as a bright green light in the microscope The power of the gene is that by using recombinant DNA technology GFP can be spliced to any protein essentially painting that protein green When such a spliced protein is inside a cell Further time lapse microscopy can be used to examine how that protein and the cellular components that it is part of move within the cell during the cell's life cycle This Methods in Enzymology volume deals with the utility of green fluorescent protein GFP The OVID database including MEDLINE Current Contents and other sources lists nine references to GFP for the ten year period 1985 1994 In contrast in less than four years thereafter over 500 references are listed a testament to the rapid growth of interest in this probe This volume documents many diverse uses for this interesting molecule in disciplines that broadly span biology The methods presented include shortcuts and conveniences not included in previously published sources The techniques are described in a context that allows comparisons to other related methodologies such comparisons are valuable to readers who must adapt existing procedures to new systems Also so far as possible methodologies have been presented in a manner that stresses their general applicability and potential limitations The volume provides a substantial and current overview of the extant methodology in the field and a view of its rapid development The critically acclaimed laboratory standard for more than forty years Methods in Enzymology is one of the most highly respected publications in the field of biochemistry Since 1955 each volume has been eagerly awaited frequently consulted and praised by researchers and reviewers alike Now with more than 300 volumes all of them still in print the series contains much material still relevant today truly an essential publication for researchers in all fields of life sciences Key Features Monitoring of Physiological Processes Localization of Molecules Special Uses Mutants Variants of GFP

Fluorescent Proteins I Gregor Jung, 2011-10-25 Fluorescent proteins are intimately connected to research in the life sciences Tagging of gene products with fluorescent proteins has revolutionized all areas of biosciences ranging from fundamental biochemistry to clinical oncology to environmental research The discovery of the Green Fluorescent Protein its first seminal application and the ingenious development of a broad palette of fluorescence proteins of other colours was consequently recognised with the Nobel Prize for Chemistry in 2008 Fluorescent Proteins I is devoted to the basic photophysical and photochemical aspects of fluorescent protein technology Experienced experts highlight colour tuning the exploration of switching phenomena and respective methods for their investigation The book provides a thorough

understanding of primary molecular processes allowing the design of fluorescent proteins for specific applications

Fluorescent Proteins II Gregor Jung, 2012-01-05 Fluorescent proteins are intimately connected to research in the life sciences Tagging of gene products with fluorescent proteins has revolutionized all areas of biosciences ranging from fundamental biochemistry to clinical oncology to environmental research The discovery of the Green Fluorescent Protein its first seminal application and the ingenious development of a broad palette of fluorescence proteins of other colours was consequently recognised with the Nobel Prize for Chemistry in 2008 *Fluorescent Proteins II* highlights the physicochemical and biophysical aspects of fluorescent protein technology beyond imaging It is tailored to meet the needs of physicists chemists and biologists who are interested in the fundamental properties of fluorescent proteins while also focussing on specific applications The implementations described are cutting edge studies and exemplify how the physical and chemical properties of fluorescent proteins can stimulate novel findings in life sciences *Viral Applications of Green Fluorescent Protein* Barry W. Hicks, 2009-04-01 Over the last ten years Green Fluorescent Proteins along with the other spectral variants have emerged from near obscurity to become a powerful and versatile tool in scientific research In *Viral Applications of Green Fluorescent Protein Methods and Protocols* leading investigators from around the world contribute detailed examples of both the construction and application of fluorescent proteins delivered by viruses in a format crafted to produce rapid readily reproducible results Written in the style of the popular and successful *Methods in Molecular Biology*TM series the chapters include brief introductions to the topics lists of the necessary materials and reagents step by step laboratory protocols and Notes sections which highlight tips on troubleshooting and avoiding known pitfalls Cutting edge and easy to use *Viral Applications of Green Fluorescent Protein Methods and Protocols* supplies researchers with an ideal guide to the many uses of GFP and a vital starting point for future studies utilizing this highly adaptable protein **Fluorescent Proteins II** Gregor Jung, 2012-01-05 Fluorescent proteins are intimately connected to research in the life sciences Tagging of gene products with fluorescent proteins has revolutionized all areas of biosciences ranging from fundamental biochemistry to clinical oncology to environmental research The discovery of the Green Fluorescent Protein its first seminal application and the ingenious development of a broad palette of fluorescence proteins of other colours was consequently recognised with the Nobel Prize for Chemistry in 2008 *Fluorescent Proteins II* highlights the physicochemical and biophysical aspects of fluorescent protein technology beyond imaging It is tailored to meet the needs of physicists chemists and biologists who are interested in the fundamental properties of fluorescent proteins while also focussing on specific applications The implementations described are cutting edge studies and exemplify how the physical and chemical properties of fluorescent proteins can stimulate novel findings in life sciences **Design Principles of Green Fluorescent Proteins - Why are They Green and Fluorescent?** Chi-Yun Lin, 2020 Since its discovery in jellyfish around the early 1960s green fluorescent protein GFP and its derivatives have become the most widely used in vivo imaging tools for biological studies Mutants of

GFPs have been engineered to exhibit a palette of colors wide range of fluorescence quantum yields FQYs and photoswitching characteristics enabling advanced applications such as optogenetics and super resolution microscopy However tailoring GFPs for specific purposes heavily relies on extensive screening and or directed evolution as it is unclear how the protein environment modulates the photophysics of the chromophore in quantitative terms Thanks to the semisynthetic split GFP method and the recently popularized technique for incorporating noncanonical amino acids i e amber suppression we created conventionally inaccessible GFP mutants with systematically altered electrostatic properties and or steric bulk of the chromophore and the surrounding protein environment Correlations between various photophysical properties of these mutants led to transparent models describing how the protein chromophore interactions affect the chromophore s color and FQY The models provide quantitative predictions for designing GFPs with desired phenotypes and infer physically imposed limitations In addition our finding of how electrostatics biases photoisomerization pathways in GFPs could shed light on the general phenomenon of bond specific photoisomerization a defining characteristic of the retinal chromophore within rhodopsins central to vision and important to the field of photoactive molecular devices

The Fluorescent Protein Revolution Richard N. Day, Michael W. Davidson, 2014-04-28 Advances in fluorescent proteins live cell imaging and superresolution instrumentation have ushered in a new era of investigations in cell biology medicine and physiology From the identification of the green fluorescent protein in the jellyfish *Aequorea victoria* to the engineering of novel fluorescent proteins

The Fluorescent Protein Revolution American Society for Cell Biology, 1999 This volume is an authoritative and comprehensive treatment of the approaches and techniques used for Green Fluorescent Proteins GFP The primary focus of this work is on research using biological systems The volume covers all aspects of GFP from its expression in different organisms to specific microscopic and data analysis methods Key Features Only volume on Green Fluorescent Protein research Covers all aspects of GFP Provides specific microscopic and data analysis methods Discusses the design and construction of GFP fusion proteins Covers GFP expression in animals insects plants and microbes Details procedures for time lapse imaging of living cells Explains how to implement single molecule fluorescence detection with GFP Discusses dual label GFP strategies for multicolor fluorescence Presents fluorescence resonance energy transfer methods with GFPs Details quantitative fluorescence imaging techniques Extensively illustrated with color photographs

Fluorescent Proteins Kevin F. Sullivan, 2007-12-14 This new edition of *Fluorescent Proteins* presents current applications of autofluorescent proteins in cell and molecular biology authored by researchers from many of the key laboratories in the field Starting from a current review of the broad palette of fluorescent proteins available several chapters focus on key autofluorescent protein variants including spectral variants photodynamic variants as well as chimeric FP approaches Molecular applications are addressed in chapters that detail work with single molecules approaches to generating protein fusions and biosensors as well as analysis of protein protein interactions in vivo by FRET fluorescence

polarization and fluorescence cross correlation techniques A number of approaches to in vivo dynamics are presented including FRAP photoactivation and 4 dimensional microscopy Behavior of spindle components membrane proteins mRNA trafficking as well as analysis of cell types in tissues and in development are detailed and provide models for a wide variety of experimental approaches In addition several chapters deal directly with the computational issues involved in processing multidimensional image data and using fluorescent imaging to probe cellular behavior with quantitative modeling This volume brings together the latest perspective and techniques on fluorescent proteins and will be an invaluable reference in a wide range of laboratories

Green Fluorescent Proteins Shelley Rose McRae,2009

Fluorescent Protein

Revolution Richard N. Day,2014 Advances in fluorescent proteins live cell imaging and superresolution instrumentation have ushered in a new era of investigations in cell biology medicine and physiology From the identification of the green fluorescent protein in the jellyfish *Aequorea victoria* to the engineering of novel fluorescent proteins The Fluorescent Protein Revolution explores the history properties and applications of these important probes The book first traces the history of fluorescent proteins and the revolution they enabled in cellular imaging It then discusses fluorescent proteins with novel photophysical properties The book also covers several cutting edge imaging applications These include superresolution microscopy of cellular fine structures FRET microscopy to visualize protein interactions and cell signaling activities inside living cells photobleaching and photoactivation techniques to visualize protein behaviors techniques that exploit plant and algal photoreceptors to enable light regulated control of enzymatic activities and the noninvasive imaging of tumor host interactions in living animals In color throughout this book presents the fundamental principles and latest advances in the field including the associated development of imaging techniques that exploit fluorescent proteins It is accessible to a broad audience from optical imaging experts to novices needing an introduction to the field

Spectroscopic Properties of

Site-specifically Modified Green Fluorescent Proteins Ariane Plancherel,2003

Fluorescence Kinetics of the Green

Fluorescent Protein (GFP) Andreas Kummer,2000

Green Fluorescent Protein as a Mechanical Sensor Taro Michael

Muso,Harvard University--MIT Division of Health Sciences and Technology,2007 Inquiry into intracellular and cytoskeletal mechanics requires an intracellular mechanical sensor to verify models of sub cellular structure dynamics To this end the green fluorescent protein GFP is considered as a mechanical sensor candidate with many desirable characteristics Implicit solvent molecular dynamics CHARMM simulations demonstrated details inaccessible by AFM and OT methods such as the linkage dependency of fluorophore environment changes and the energy exchanges between protein components during protein unfolding Theoretical considerations and in vitro experiments explored the parameters important to GFP conjugation by N hydroxysuccinimide NHS ester chemistry and the complexities associated with a polymer approach to a controlled distribution of force across fluorescent proteins in a polyacrylamide PAM gel

Fluorescent Proteins Mayank

Sharma,2022-09-15 This volume brings together cutting edge laboratory protocols to characterize the novel fluorescent

proteins FPs and approaches based on fluorescent proteins that aim to answer some of the key cell biological questions The book covers topics ranging from the database of fluorescent proteins to their characterization and adaptation to a wide range of biological systems Written for the highly successful Methods in Molecular Biology series chapters include introductions to their respective topics lists of the necessary materials and reagents step by step and readily reproducible laboratory protocols and tips on troubleshooting and avoiding known pitfalls Authoritative and practical **Fluorescent Proteins Methods and Protocols** serves as an ideal guide for students and academicians enthusiastic about the recent progress in the practical application of fluorescent protein technology

Ultrafast Dynamics in the Photosynthetic Reaction Center and Green Fluorescent Proteins Brett Andrew King, 2000

Green Fluorescent Protein and Its 10th [beta]-strand Keunbong Do, 2014

Truncated green fluorescent protein GFP that is refolded after removing the 10th beta strand s10 can readily bind to a synthetic strand to recover the absorbance and the fluorescence of the whole protein This allows rigorous experimental determination of thermodynamic and kinetic parameters of the split system including the equilibrium and the association dissociation rate constants which enables residue specific analysis of protein peptide interactions The equilibrium constant obtained from the ratio of the two rate constants agrees with that directly estimated from the binding isotherm which supports the one to one binding model In measuring the dissociation rate of s10 it was discovered that the strand can photodissociate where the dissociation rate is greatly increased by light irradiation We found that in the overall photodissociation process a thermal step follows light activation of the molecule and the thermal activation barrier was determined through an Arrhenius plot of the rate constants acquired at a saturating light intensity The thermal step could be selectively affected by mutating residue 209 on s10 and by changing the solvent viscosity which suggests that the thermal step is the actual dissociation of s10 In the process we found that the quantum yield of photodissociation can be enhanced by increasing the temperature or lowering the viscosity of the solvent or by introducing mutations such as K209Q or Y203T For the light activation step cis trans isomerization of the chromophore could be suggested as the underlying mechanism referring to the previous work on truncated GFP with strand 11 removed Kent and Boxer 2011 Photodissociation links photoexcitation of the protein to its conformational change which opens the possibility of using GFP in caging Finally GFP variants carrying one extra s10 were created and characterized and their possible applications were explored These proteins can fold with either one or the other s10 and the ratio of the two folded forms unambiguously distinguished by their resulting colors can be systematically modulated by mutating the residues on s10 or by changing the lengths of the two inserted linker sequences that connect each s10 to the rest of the protein Exploiting studies on photodissociation ratiometric protease sensors were designed from the construct by engineering a specific protease cleavage site into one of the inserted loops where the bound s10 is replaced by the other strand upon protease cleavage and irradiation with light to switch its color Since the conversion involves a large spectral shift these genetically encoded sensors display very high ratiometric dynamic

range Further engineering of this class of proteins guided by mechanistic understanding of the light driven process will enable interesting and useful applications of the protein

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