Correlative Light And Electron Microscopy Volume 111 Methods In Cell Biology

This Open Access textbook provides students and researchers in the life sciences with essential practical information on how to quantitatively analyze data images. It refrains from focusing on theory, and instead uses practical examples and step-by step

protocols to familiarize readers with the most commonly used image processing and analysis platforms such as ImageJ, MatLab and Python. Besides gaining knowhow on algorithm usage, readers will learn how to create an analysis pipeline by scripting language; these skills are important in order to document reproducible image analysis workflows. The textbook is chiefly intended for advanced undergraduates in the life sciences and biomedicine

without a theoretical background in data analysis, as well as for postdocs, staff scientists and faculty members who need to perform regular quantitative analyses of microscopy images.

A guide to modern scanning electron microscopy instrumentation, methodology and techniques, highlighting novel applications to cell and molecular biology.

Correlative Light and Electron

Microscopy III, Volume 140, a new volume in the Methods in Cell Biology, series continues the legacy of this premier serial with quality chapters authored by leaders in the field. This is the third volume of Methods in Cell Biology covering current Correlative Light and Electron Microscopy (CLEM) methodologies. The field of CLEM is still growing and new combinations of imaging technologies provide exciting new insights. The chapters deal with

different approaches to analyze the same specimen by more than one imaging technique to gain more and/or better information over applying each imaging technique separately. The strengths and application area of each presented CLEM approach are highlighted. This volume explores the aspects of sample preparation of diverse biological systemsfor different CLEM approaches and will serve as a valuable resource to researchers in the field of cell

biology. Contains contributions from experts in the field Covered topics include targeted ultramicrotomy and high-precision correlation Presents recent advances and currently applied correlative approaches Gives detailed protocols allowing the application of workflows in one's own laboratory setting Covers CLEM approaches in the context of specific applications Aims to stimulate the use of new combinations of imaging modalities

Instrumentation and Methods

Correlative Imaging

Scanning Electron Microscopy for the Life Sciences

Fabrication and Quantitative Correlative Light-electron Microscopy of Novel Plasmonic Nanoparticles

Liquid Cell Electron Microscopy

The Advanced Study Institute provided an opportunity for researchers in universities, industry and National and International Laboratories, from the disciplines ofmaterials science, physics, chemistry and engineering to meet together in

an assessment of the impact of electron and scanning probe microscopy on advanced material research. Since these researchers have traditionally relied upon different approaches, due to their different scientific background, to advanced materials problem solving, presentations and discussion within the Institute sessions were initially devoted to developing a set ofmutually understood basic concepts, inherently related to different techniques ofcharacterization by microscopy and spectroscopy. Particular importance was placed on Electron Energy Loss Spectroscopy (EELS), Scanning Probe Microscopy (SPM), High Resolution Transmission and Scanning Electron Microscopy (HRTEM, HRSTEM) and Environmental Scanning Electron Microscopy (ESEM). It was recognized that the

electronic structure derived directly from EELS analysis as well as from atomic positions in HRTEM or High Angle Annular Dark Field STEM can be used to understand the macroscopic behaviour of materials. The emphasis, however, was upon the analysis of the electronic band structure of grain boundaries, fundamental for the understanding of macroscopic quantities such as strength, cohesion, plasticity, etc.

The combination of electron microscopy with transmitted light microscopy (termed correlative light and electron micros© CLEM) has been employed for decades to generate molecular identification that can be visualized by a dark, electron-dense precipitate. This new volume of Methods in Cell Biology covers many areas of CLEM, including a brief history and overview on

CLEM methods, imaging of intermediate stages of meiotic spindle assembly in C. elegans embryos using CLEM, and capturing endocytic segregation events with HPF-CLEM. Covers many areas of CLEM by the best international scientists in the field Includes a brief history and overview on CLEM methods The volume covers the preparation and analysis of model systems for biological electron microscopy. The volume has chapters about prokaryotic as well as eukaryotic systems that are used as so-called model organisms in modern cell biology. These systems include the most popular systems, such as budding and fission yeast, the roundworm C. elegans, the fly Drosophila, zebrafish, mouse, and Arabidopsis, but also organisms that are less frequently used in cell biology, such as Chlamydomonas,

Dictyostelium, Trypanosoma, faltworms, Axolotl and others. In addition, tissues and tissue culture systems are also covered. These systems are used for very diverse areas of cell biology, such as cell division, abscission, intracellular transport, cytoskeletal organization, tissue regeneration and others. Moreover, this issue presents the currently most important methods for the preparation of biological specimens. This volume, however, is not a classic EM methods book. The methods are not the main focus of this issue. The main goal here is to cover the methods in the context of the specific requirements of specimen preparation for each model organism or systems. This will be the first compendium covering the various aspects of sample preparation of very diverse biological systems. Covers the preparation and

analysis of model systems for biological electron microscopy Includes the most popular systems but also organisms that are less frequently used in cell biology Presents the currently most important methods for the preparation of biological specimens First compendium covering the various aspects of sample preparation of very diverse biological systems

Imaging and Quantifying Neuronal Autophagy

Confocal Raman Microscopy

New Strategies for Improved Throughput and Targeting Precision

Biomedical Imaging

Biological Field Emission Scanning Electron Microscopy

This second edition provides a cutting-edge

overview of physical, technical and scientific aspects related to the widely used analytical method of confocal Raman microscopy. The book includes expanded background information and adds insights into how confocal Raman microscopy, especially 3D Raman imaging, can be integrated with other methods to produce a variety of correlative microscopy combinations. The benefits are then demonstrated and supported by numerous examples from the fields of materials science, 2D materials, the life sciences, pharmaceutical research and development, as well as the geosciences.

The go?to resource for microscopists on biological applications of field emission gun scanning electron microscopy (FEGSEM) The evolution of scanning electron microscopy technologies and capability over the past few years has revolutionized the biological imaging capabilities of the microscope—giving it the capability to examine surface structures of cellular membranes to reveal the organization of individual proteins across a membrane bilayer and the arrangement of cell cytoskeleton at a nm scale. Most notable are their improvements for field emission scanning electron microscopy

(FEGSEM), which when combined with cryo-preparation techniques, has provided insight into a wide range of biological questions including the functionality of bacteria and viruses. This full-colour, must-have book for microscopists traces the development of the biological field emission scanning electron microscopy (FEGSEM) and highlights its current value in biological research as well as its future worth. Biological Field Emission Scanning Electron Microscopy highlights the present capability of the technique and informs the wider biological science community of its application in basic

biological research. Starting with the theory and history of FEGSEM, the book offers chapters covering: operation (strengths and weakness, sample selection, handling, limitations, and preparation); Commercial developments and principals from the major FEGSEM manufacturers (Thermo Scientific, JEOL, HITACHI, ZEISS, Tescan); technical developments essential to bioFEGSEM; cryobio FEGSEM; cryo-FIB; FEGSEM digital-tomography; array tomography; public health research; mammalian cells and tissues; digital challenges (image collection, storage, and automated data analysis); and more. Examines

the creation of the biological field emission gun scanning electron microscopy (FEGSEM) and discusses its benefits to the biological research community and future value Provides insight into the design and development philosophy behind current instrument manufacturers Covers sample handling, applications, and key supporting techniques Focuses on the biological applications of field emission gun scanning electron microscopy (FEGSEM), covering both plant and animal research Presented in full colour An important part of the Wiley-Royal Microscopical Series, Biological Field

Emission Scanning Electron Microscopy is an ideal general resource for experienced academic and industrial users of electron microscopy—specifically, those with a need to understand the application, limitations, and strengths of FEGSEM.

Correlative Microscopy in Biology: Instrumentation and Methods presents the detailed methodology of biological correlative microscopy, a technology that allows the acquisition of multiple data from single tissue block, cell, or section. The chapters in the book include detailed and complete instructions on the preparatory

procedures. The book has 20 chapters that deal with various forms and systems of microscopy. Some of the forms and methods used in the book include light, scanning electron, fluorescence, scanning transmission electron, and ion microscopy, as well as combined light and electron and transmission electron microscope. Other methods and their applications are all discussed in detail in the book. This book will help students apply the methods without outside help as each methodology is presented in a step-by-step approach, including applications and techniques. Aside from students, the book

will also be good reference for teachers, scientists, and researchers in the fields of biology, biochemistry, and medicine.

Novel Approaches for Correlative Light and Electron Microscopy to Study Insulin Secretory Granule Ageing

Developing Tools for Visualizing Human Mitoribosomes Using Correlative Light and Electron Microscopy

Plant Endosomes

Advanced Imaging and Bio Techniques for Convergence Science

The Optimsation of Correlative Light Electron Microscopy Techniques and Their Application

in the Study of Endocytic Sorting Events

This second edition details techniques for the study of cargo trafficking through endosomes. New and updated chapters guide readers through methods and protocols on the structural aspects of plant endosomes, combined biochemical, omics, imaging approaches to study the dynamics and contents of endosomal compartments. Additional chapters are dedicated to the analysis of lipids on endosomes and the identification and analysis of lipid binding proteins and lipid-binding domains relevant for the study of plant endosomes. Written in the highly successful Methods in Molecular Biology series

format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and cutting-edge, Plant Endosomes: Methods and Protocols, Second Edition aims to ensure successful results in the further study of this vital field.

The volume aims to explore the dynamic nature of the autophagy pathway, and the latest techniques that allow researchers to capture and quantify this process in neurons. The chapters in this volume cover topics such as fundamental, historical, and

functional approaches that began in baker's yeast; Saccharomyces cerevisiae; the role of both electron microscopy and live-cell imaging using fluorescently tagged autophagy proteins; and the rate of puncta appearance and its correlation with the rate of autophagosome formation. In the Neuromethods series style, chapters include the kind of detail and key advice from the specialists needed to get successful results in your laboratory. Cutting-edge and practical, Imaging and Quantifying Neuronal is a valuable resource that provides insights into the power of microscopy tools, live-cell imaging, and photoactivation and correlative techniques. .

This book is a wide-ranging guide to advanced imaging techniques and related methods with important applications in translational research or convergence science as progress is made toward a new era in integrative healthcare. Conventional and advanced microscopic imaging techniques, including both non-fluorescent (i.e., label-free) and fluorescent methods, have to date provided researchers with specific and quantitative information about molecules, cells, and tissues. Now, however, the different imaging techniques can be correlated with each other and multimodal methods developed to simultaneously obtain diverse

and complementary information. In addition, the latest advanced imaging techniques can be integrated with non-imaging techniques such as mass spectroscopic methods, genome editing, organic/inorganic probe synthesis, nanomedicine, and drug discovery. The book will be of high value for researchers in the biological and biomedical sciences or convergence science who need to use these multidisciplinary and integrated techniques or are involved in developing new analytical methods focused on convergence science.

Development of Novel Probes for Correlative Light Electron Microscopy

Electron Microscopy of Model Systems
Protocols for Macroalgae Research
Automated Correlative Light and Electron Microscopy Using FIB-SEM as a Tool to Screen for Ultrastructural Phenotypes
Bioimage Data Analysis Workflows

Recent advances in the imaging technique electron microscopy (EM) have improved the method, making it more reliable and rewarding, particularly in its description of three-dimensional detail. Cellular Electron Microscopy will help biologists from many disciplines understand modern EM and the value it might

bring to their own work. The book's five sections deal with all major issues in EM of cells: specimen preparation, imaging in 3-D, imaging and understanding frozen-hydrated samples, labeling macromolecules, and analyzing EM data. Each chapter was written by scientists who are among the best in their field, and some chapters provide multiple points of view on the issues they discuss. Each section of the book is preceded by an introduction, which should help newcomers understand the subject. The book shows why many biologists believe that modern EM will forge the link between light microscopy of live

cells and atomic resolution studies of isolated macromolecules, helping us toward the goal of an atomic resolution understanding of living systems. Updates the numerous technological innovations that have improved the capabilities of electron microscopy Provides timely coverage of the subject given the significant rise in the number of biologists using light microscopy to answer their questions and the natural limitations of this kind of imaging Chapters include a balance of "how to", "so what" and "where next", providing the reader with both practical information, which is necessary to use

these methods, and a sense of where the field is going

Electron Microscopy covers all of the important aspects of electron microscopy for biologists, including theory of scanning and transmission, specimen preparation, digital imaging and image analysis, laboratory safety and interpretation of images. The text also contains a complete atlas of ultrastructure.

This book presents a wide range of tested and proven protocols relevant to a number of fields within biotechnology used in laboratory experiments in everyday phycological (seaweed)

research. A major focus will be on bioenergy related aspects of this emerging technology. These protocols will be written in a clear and concise manner using simple language permitting even nonspecialist to adequately understand the significance of this research. It will also contain all necesssary notes and guidelines for successful execution of these experiments.

Focusing on the Future

Principles and Techniques for Biologists

Correlative Light and Electron Microscopy IV

Visualisation and Analysis of Endocytic Process

by Correlative Light Electron Microscopy

Correlative Light and Electron Microscopy

The most comprehensive reference on fluorescent nanodiamond physical and chemical properties and contemporary applications Fluorescent nanodiamonds (FNDs) have drawn a great deal of attention over the past several years, and their applications and development potential are proving to be manifold and vast. The first and only book of its kind, Fluorescent Nanodiamonds is a comprehensive guide to the basic science and technical information needed to fully understand the fundamentals of FNDs and their potential applications across an array of domains. In demonstrating the importance of FNDs in biological applications, the authors bring together all

relevant chemistry, physics, materials science and biology. Nanodiamonds are produced by powerful cataclysmic events such as explosions, volcanic eruptions and meteorite impacts. They also can be created in the lab by high-pressure high-temperature treatment of graphite or detonating an explosive in a reactor vessel. A single imperfection can give a nanodiamond a specific, isolated color center which allows it to function as a single, trapped atom. Much smaller than the thickness of a human hair, a nanodiamond can have a huge surface area that allows it to bond with a variety of other materials. Because of their non-toxicity, nanodiamonds may be useful in biomedical applications, such as drug delivery and gene therapy. The most comprehensive reference on a topic of rapidly

increasing interest among academic and industrial researchers across an array of fields Includes numerous case studies and practical examples from many areas of research and industrial applications, as well as fascinating and instructive historical perspectives Each chapter addresses, in-depth, a single integral topic including the fundamental properties, synthesis, mechanisms and functionalisation of FNDs The first book published by the key patent holder with his research group in the field of FNDs Fluorescent Nanodiamonds is an important working resource for a broad range of scientists and engineers in industry and academia. It will also be a welcome reference for instructors in chemistry, physics, materials science, biology and related fields.

This volume presents current advanced technologies and methods used in super-resolution microscopy. The chapters in this book cover a wide range of topics such as introducing super-resolution microscopy into a core facility; two-photon STED microscopy for nanoscale imaging of neural morphology in vivo; correlative SIM-STORM microscopy; two-color single-molecule tracking in live cells; and correlative single molecule localization microscopy and confocal microscopy. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Cutting-edge

and comprehensive, Super-Resolution Microscopy: Methods and Protocols is a valuable resource for both established and novel researchers and users in this field.
The endosomal network comprises a series of compartments which co- ordinate sorting and trafficking of internalised cargo. The early endosome sorts internalised cargo by two distinct trafficking pathways, depending the ultimate fate of the cargo. Cargo is either recycled back to the plasma membrane or degraded by lysosomes. Given the ability of the light microscope (LM) to observe living cells, much of our understanding of the dynamic nature of cargo sorting in the endosomal network has come from observations from the LM. However, in order to fully appreciate the localisation of cargo in the context of its

membranous environment requires the resolving power of the electron microscope (EM). The examination of the same area of a biological specimen by both LM and EM can provide more information than the application of either technique alone. In particular correlative light electron microscopy (CLEM) combined with high pressure freezing (HPF) allows observation of a live cellular event to be correlated with a high-resolution snapshot of said event, preserved in a near native state. The current system for performing CLEM with HPF as the method of fixation limits the capabilities of live cell imaging. In this thesis I describe modifications to the system that have increased the achievable resolution and sensitivity of fluorescent live cell imaging and also improved the method of cellular

relocation. To observe endocytic sorting using CLEM required two novel functionalised ligand probes to represent the differentially sorted cargos epidermal growth factor receptor and transferrin receptor. The validity of these ligand- fluorophore-gold conjugates, with respect to detection by both fluorescence and electron microscopy and their ability to represent the native ligands has been shown here. With the validity of the probes established, the new system was then employed to illustrate how CL EM combined with electron tomography can provide new insights into the sorting events occurring in early endocytic compartments. As a result of this investigation however, it was found that disruption of cells during HPF is a major issue with this system of CLEM that still needs to be

resolved. As an additional investigation into endocytic sorting, I have studied the potential role of sorting nexin 15 (SNXI5) in receptor trafficking. This research has contributed to the characterisation of the SNXI5, whilst also providing mechanistic details of SNX15s role in regulation of receptor degradation. SNX 15 associates with clathrin during clathrin-mediated endocytosis and remains bound to the fully formed vesicles. The characteristic phosphoinositide-binding domain possessed by all SNX proteins means that SNX15 is also present on early endosomes. The association of SNX15 with early endocytic compartments potentially facilitates their directional movement via microtubules away from the periphery of the cell allowing compartment maturation and lysosomal fusion

to occur.

Imaging Synapse Structure and Function

The Optimisation of Correlative Light Electron Microscopy Techniques and Their Application in the Study of Endocytic Sorting Events

Principles and Applications

Development of a New Genetically-encoded Tag for Correlative Light Electron Microscopy

Super-Resolution Microscopy

Cell imaging methodologies have now become essential research tools for a variety of disciplines that traditionally had not relied on them. In Cell Imaging Techniques: Methods and Protocols, distinguished international researchers describe in detail their state-of-the-art methods for the microscopic

imaging of cells and molecules. The authors cover a wide spectrum of complementary techniques, including such methods as fluorescence microscopy, electron microscopy, atomic force microscopy, and laser scanning cytometry. Additional protocols on confocal scanning laser microscopy, quantitative computer-assisted image analysis, laser-capture microdissection, microarray image scanning, near-field scanning optical microscopy, and reflection contrast microscopy round out this eclectic collection of cutting-edge imaging techniques now available. The authors also discuss preparative methods for particles and cells by transmission electron microscopy. The protocols follow the successful Methods in Molecular Biology series format, each offering step-by-step laboratory instructions, an introduction outlining

the principles behind the technique, lists of the necessary equipment and reagents, and tips on troubleshooting and avoiding known pitfalls. Timely and highly practical, Cell Imaging Techniques: Methods and Protocols provides researchers and clinicians with a richly useful guide to selecting and performing the best imaging method from a bewildering variety of microscopy-based techniques.

This volume details a comprehensive and extensive set of protocols for the study of autophagy in vitro and in vivo. Chapters focus on mammals, various model organisms, and provide protocols for the study of autophagy-related processes outside of the canonical autophagy pathways. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their

respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and cutting-edge, Autophagy: Methods and Protocols aims to ensure successful results in the further study of this vital field.

This new volume of Methods in Cell Biology looks at methods for analyzing correlative light and electron microscopy (CLEM). With CLEM, people try to combine the advantages of both worlds, i.e. the dynamics information obtained by light microscopy and the ultrastructure as provided by electron microscopy. This volume contains the latest techniques on correlative microscopy showing that combining two imaging modalities provides more than each technique alone. Most

importantly it includes the essential protocols, including tips, tricks and images for you to repeat these exciting techniques in your own lab. With cutting-edge material, this comprehensive collection is intended to guide researchers for years to come. Covers sections on model systems and functional studies, imaging-based approaches and emerging studies Chapters are written by experts in the field Cutting-edge material Second of two volumes dedicated to Correlative Light and Electron microscopy (CLEM)

Methods and Protocols

Autophagy

Strategies and Applications

Methods of Studying Neurons

Three-Dimensional Electron Microscopy, Volume 152 in the Methods in Cell Biology series, highlights new advances in the field, with this new volume presenting interesting chapters focusing on FIB-SEM of mouse nervous tissue: fast and slow sample preparation, Serial-section electron microscopy using ATUM - Automated Tape collecting Ultra-Microtome, Software for automated acquisition of electron tomography tilt series, Scanning electron tomography of biological samples embedded in plastic, Cryo-STEM tomography for Biology, CryoCARE: Content-aware denoising of cryo-EM images and tomograms using artificial neural networks, Expedited large-volume 3-D SEM workflows for comparative vertebrate microanatomical imaging, and many other interesting topics. Provides the

authority and expertise of leading contributors from an international board of authors Presents the latest release in the Methods in Cell Biology series Includes the latest information on the Three-Dimensional Electron Microscopy technique

Brings a fresh point of view to the current state of correlative imaging and the future of the field This book provides contributions from international experts on correlative imaging, describing their vision of future developments in the field based on where it is today. Starting with a brief historical overview of how the field evolved, it presents the latest developments in microscopy that facilitate the correlative workflow. It also discusses the need for an ideal correlative probe, applications in

proteomic and elemental analysis, interpretation methods, and how correlative imaging can incorporate force microscopy, soft x-ray tomography, and volume electron microscopy techniques. Work on placing individual molecules within cells is also featured. Correlative Imaging: Focusing on the Future offers in-depth chapters on: correlative imaging from an LM perspective; the importance of sample processing for correlative imaging; correlative light and volume EM; correlation with scanning probe microscopies; and integrated microscopy. It looks at: cryo-correlative microscopy; correlative cryo soft X-ray imaging; and array tomography. Hydrated-state correlative imaging in vacuo, correlating data from different imaging modalities, and big data in correlative imaging are also considered.

Brings a fresh view to one of the hottest topics within the imaging community: the correlative imaging field Discusses current research and offers expert thoughts on the field's future developments Presented by internationally-recognized editors and contributors with extensive experience in research and applications Of interest to scientists working in the fields of imaging, structural biology, cell biology, developmental biology, neurobiology, cancer biology, infection and immunity, biomaterials and biomedicine Part of the Wiley–Royal Microscopical Society series Correlative Imaging: Focusing on the Future will appeal to those working in the expanding field of the biosciences, correlative microscopy and related microscopic areas. It will also benefit graduate students working in

microscopy, as well as anyone working in the microscopy imaging field in biomedical research.

Correlative Light and Electron Microscopy IV, Volume 162, a new volume in the Methods in Cell Biology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. Besides the detailed description of protocols for CLEM technologies including time-resolution, Super resolution LM and Volume EM, new chapters cover Workflow (dis)-advantages/spiderweb, Serial section LM + EM, Platinum clusters as CLEM probes, Correlative Light Electron Microscopy with a transition metal complex as a single probe, SEM-TEM-SIMS, HPF-CLEM, A new workflow for high-throughput screening of mitotic mammalian cells for electron microscopy using classic

histological dyes, and more. Contains contributions from experts in the field Covers topics using nano-SIMS and EDX for CLEM Presents recent advances and currently applied correlative approaches Gives detailed protocols, allowing for the application of workflows in one's own laboratory setting Covers CLEM approaches in the context of specific applications Aims to stimulate the use of new combinations of imaging modalities

Correlative Microscopy In Biology

Correlative Light and Electron Microscopy II

Three-Dimensional Electron Microscopy

Automated Correlative Light and Electron Microscopy Using FIB-SEM as a Tool to Screen for Ulltrastructural Phenotypes

Cellular Electron Microscopy

This book presents and describes imaging technologies that can be used to study chemical processes and structural interactions in dynamic systems, principally in biomedical systems. The imaging technologies, largely biomedical imaging technologies such as MRT, Fluorescence mapping, raman mapping, nanoESCA, and CARS microscopy, have been selected according to their application range and to the chemical information content of their data. These technologies allow for the analysis and evaluation of delicate biological samples, which must not be disturbed during the profess. Ultimately, this may mean fewer

animal lab tests and clinical trials.

Development of new imaging technologies in recent years has transformed neuroscience in profound ways. Following on the heels of the revolution based on the Green Fluorescent Protein, refined genetically-encoded fluorescent reporters and genetic targeting strategies now enable optical recording of synaptic transmission in defined neuronal populations at speeds approaching the enviable temporal resolution of electrophysiology. Super-resolution light microscopy permits observation of synapses and their molecular machinery at sub-diffraction resolution. At

the ultrastructural level, automated forms of electron microscopy, improvements in specimen fixation methods, and recent efforts to correlate data from light and electron micrographs now make the reconstruction of functional neural circuits a reality. Finally, the use of optogenetic actuators, such as channelrhodopsins, allows precise temporal and spatial manipulation of neuronal activity and is revealing profound insights into the organization of neural circuits and their roles in behavior. This research topic highlights recent advances in both light and electron microscopy, with a specific focus on

approaches that combine innovations from several different fields to obtain novel information about synapse structure and function. We are confident that this collection of articles - three original research papers, six reviews, one methods paper and one perspective article - will enable neuroscientists to achieve the next generation of experiments aimed at cracking the neural code.

Fluorescent Nanodiamonds

Development of Luminescent Transition Metal Complexes for Correlative Light and Electron Microscopy and Super Resolution Microscopy

Impact of Electron and Scanning Probe Microscopy on Materials Research

Correlative Light and Electron Microscopy III

Electron Microscopy