

three dimensional electron microscopy of macromolecular assemblies visualization of biological molecules in their

[#3D electron microscopy](#) [#Macromolecular assemblies](#) [#Biological molecule imaging](#) [#Molecular visualization techniques](#) [#Structural biology research](#)

Explore the advanced capabilities of three-dimensional electron microscopy for visualizing macromolecular assemblies. This powerful technique provides high-resolution insights into complex biological molecules, crucial for understanding their structure, function, and interactions within cellular environments.

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three dimensional electron microscopy of macromolecular assemblies visualization of biological molecules in their

(PDF)Three-Dimensional Electron Microscopy of Macromolecular Assemblies 2nd Edition -

(PDF)Three-Dimensional Electron Microscopy of Macromolecular Assemblies 2nd Edition by Jerrmy Lance 13 views 5 years ago 5 seconds - Download link: ...

Determining 3D structures of macromolecular complexes using Cryo-EM to understand function -

Determining 3D structures of macromolecular complexes using Cryo-EM to understand function by Electron Microscopy from Thermo Fisher Scientific 6,985 views 11 years ago 3 minutes, 47 seconds -

"Holger Stark from **the**, Max Planck Institute in Göttingen, Germany discusses current advancements in cryo-TEM to examine **the**, ...

Methods for Determining Atomic Structures: 3D Electron Microscopy (from PDB-101) - Methods for Determining Atomic Structures: 3D Electron Microscopy (from PDB-101) by RCSBProteinDataBank

7,427 views 2 years ago 58 seconds - Electron microscopy,, frequently referred to as 3DEM, is increasingly used to determine 3D structures of large **macromolecular**, ...

Electron Microscopy (TEM and SEM) - Electron Microscopy (TEM and SEM) by Professor Dave

Explains 209,659 views 3 years ago 8 minutes, 44 seconds - We've talked **a**, lot about light **microscopy**,, but this technique has inherent limitations in resolution and magnification. **The**, next ...

Electron Microscopy

resolution of 0.2 nm

electron gun

TEM still does have specific limitations

Scanning Electron Microscopy (SEM)

SEM is for studying topography

SEM can produce 3D images

Transmission Electron Microscopy (TEM)

Yifan Cheng (UCSF & HHMI) 1: Single Particle Cryo-EM - Yifan Cheng (UCSF & HHMI) 1: Single Particle Cryo-EM by Science Communication Lab 31,512 views 6 years ago 34 minutes - Yifan Cheng overviews **the**, principles of Cryo-EM, and describes how advances in this technique have allowed

scientists to solve ...

Intro

Electron microscope

Wave-particle duality of electron

Electron v.s X-ray

Reconstructing 3D object from 2D projection images

Molecular electron microscopy of biological sample

Structure of unstained crystalline specimen by electron microscopy

Single particle EM: Averaging low dose image of non-periodic objects

Frozen hydrated specimen preparation for single particle cryo-EM

Atomic resolution imaging with TEM

Image recorded with scintillator based camera

CMOS direct detection camera

Single electron counting by the K2 Summit (UCSF, LBNL, Gatan)

K2 image of frozen hydrated protein samples, archaeal 20S proteasome

Electron beam induced image motion

Direct electron detection improves image quality

Beam-induced image motion deteriorate image quality

Robust motion correction recovers high-resolution information

We achieved resolution comparable with X-ray crystallography

Local motion correction: tracking individual particles

MotionCor2: correction of global

Improved motion correction leads to better resolution

Single particle electron cryo-microscopy (cryo-EM)

History of Molecular Visualizations of Biological Macromolecules - History of Molecular Visualizations of Biological Macromolecules by IIT Roorkee July 2018 795 views 2 years ago 49 minutes - A, beautiful journey of macromolecule **visualization**, has been depicted in this lecture starting from metal-made models to Byran ...

Cryo-Electron Microscopy at NIEHS - Cryo-Electron Microscopy at NIEHS by NIEHS 11,121 views 6 years ago 3 minutes, 54 seconds - This video shows how **the**, NIEHS Cryo-EM Facility generates 3D images of large proteins. If you are **a**, scientist in **the**, Southeast ...

The 2017 Nobel Prize in Chemistry: Cryo-electron microscopy explained - The 2017 Nobel Prize in Chemistry: Cryo-electron microscopy explained by Chemical & Engineering News 130,501 views 6 years ago 5 minutes - Jacques Dubochet, Joachim Frank, and Richard Henderson have claimed **the**, 2017 Nobel Prize in Chemistry for **their**, ...

Intro

What is cryoelectron microscopy

Richard Henderson

Jacques de Vache

Why is this a chemistry prize

Dr Richard Henderson - Using electron microscopy to understand the molecules of life - Dr Richard Henderson - Using electron microscopy to understand the molecules of life by Cambridge Philosophical Society 517 views 1 year ago 49 minutes - Structural **biology**, has been highly successful during **the**, last 60 years. **The**, first protein structure of sperm whale myoglobin was ...

Introduction

Braggs Law

Structural Biology

Cytomegalovirus

Coronavirus

Why do we need electron microscopy

The potential of electron microscopy

Higher resolution models

Adenovirus

New electron detectors

Ribosomes

Mitochondria

Hemoglobin

Protein database

Exponential growth

Comparisons

New structures

Drug design

Gprotein-coupled receptors

Future of structural biology

Acknowledgements

How do Electron Microscopes Work? ~~Taking~~ Taking Pictures of Atoms - How do Electron Microscopes Work? ~~Taking~~ Taking Pictures of Atoms by Branch Education 2,357,785 views 5 months ago 19 minutes

- The, nanoscopic world is wild!! Looking at basic objects like **a**, grain of salt under **an electron microscope**, looks like nothing you ...

The Nanoscopic World

Scanning Electron Microscope vs Transmission Electron Microscope

Basics of Transmission Electron Microscopes

Why use Electrons instead of Light?

Parts of the Electron Microscope

Magnification: Objective and Projector

Physics of a Magnetic Lens

Thermo Fisher Scientific Sponsorship

Scanning Electron Microscope

Preparation of cells for cryo-electron tomography - Preparation of cells for cryo-electron tomography by Electron Microscopy from Thermo Fisher Scientific 11,654 views 3 years ago 4 minutes, 30 seconds - The, Thermo Fisher cryo-**electron**, tomography workflow covers flash freezing cells to final 3D **visualization**,. Interior cellular regions ...

Have you ever seen an atom? - Have you ever seen an atom? by nature video 23,874,000 views 10 years ago 2 minutes, 32 seconds - Scientists at **the**, University of California Los Angeles have found **a**, way to create stunningly detailed 3D reconstructing of platinum ...

Understanding Crystallography - Part 1: From Proteins to Crystals - Understanding Crystallography - Part 1: From Proteins to Crystals by The Royal Institution 264,968 views 9 years ago 7 minutes, 48 seconds - How can you determine **the**, structure of **a**, complex **molecule**, from **a**, single crystal? Professor Elspeth Garman take us on **a**, journey ...

Lysozyme

X-Ray Crystallography

Protein Production and Purification Lab

Crystallization Lab

Electron microscope | TEM | SEM | Cryo EM - Electron microscope | TEM | SEM | Cryo EM by Quick Biochemistry Basics 175,225 views 4 years ago 7 minutes, 34 seconds - An electron microscope, is **a**, microscope that uses **a**, beam of accelerated electrons as **a**, source of illumination. **The**, electron ...

Introduction

Transmission electron microscope

Scanning electron microscope

Cryo electron microscope

R1. Determining, Analyzing, and Understanding Protein Structures - R1. Determining, Analyzing, and Understanding Protein Structures by MIT OpenCourseWare 15,876 views 4 years ago 29 minutes - This recitation covers different techniques that are used to determine protein structure, as well as using **the**, Protein Data Bank ...

Intro

Why Determine Protein Structure

Interactions with Other Macromolecules

Protein Structures

Xray Diffraction

Nuclear Magnetic Resonance

Electron Microscope

Protein Databank

Crystallography

diffraction pattern

phase

limitations

crystallization

translation

modification
dynamics
one structure
resolution
reflections
redundancy
noughstuffers

merge
high resolution bin
raw data
free
B factor
RMSD

2 The Principle of the Electron Microscope - 2 The Principle of the Electron Microscope by Electron Microscopy from Thermo Fisher Scientific 214,064 views 7 years ago 10 minutes, 21 seconds - How to Make **a**, Microscope, Chapter 2 Unlike **the**, optical microscope, **the**, scanning **electron microscope**, uses accelerated ...

Dr Ernst Ruska
Column of the Electron Microscope
Electron Beam

Basic Types of Electron Microscope Scanning and Transmission

The Image Quality in the Scanning Microscope

Transmission Electron Microscope (TEM) - Transmission Electron Microscope (TEM) by LD SEF 47,705 views 4 years ago 7 minutes, 50 seconds - Hi my name is Jamie riches and I'll be showing you **the**, transmission **electron microscope**, or TEM today we'll use that to look at **the**, ...

Sample Preparation for Electron Microscopy - Sample Preparation for Electron Microscopy by Medicine Technology - School of Medicine - JU 56,963 views 5 years ago 14 minutes, 13 seconds - Medicine Technology - School of Medicine - JU Dr. Hanan Jaafar.

Processing Steps for Electron Microscopy

Dehydration

Embedding

Sectioning

Staining with Urinal Acetate

Transmission electron microscopy principle and working (TEM) - Transmission electron microscopy principle and working (TEM) by Shomu's Biology 230,969 views 3 years ago 10 minutes, 35 seconds - Transmission **electron microscopy**, principle and working lecture (TEM) - This microscopy lecture is going to explain **the**, ...

R6. Macromolecular Electron Microscopy Applied to Fatty Acid Synthase - R6. Macromolecular Electron Microscopy Applied to Fatty Acid Synthase by MIT OpenCourseWare 1,453 views 4 years ago 1 hour - Guest speaker Edward Brignole discusses **electron microscopy**,: what it can do, how it can be used, how it has changed in **the**, past ...

Radiation Damage

Direct Electron Detectors

Staining

Contrast

Signal to Noise Problem

Because if You Split this Image More That's Basically Going To Be Split on the Base of Noise because There's no Other Conformational Change or the Same Thing Would Go for Orientation if You Put this on the Grid and It Landed in Three Different Orientations You Would Want To Separate Things Out Using the Same Sort of Strategy All Right so this Gets Us to the Averages like the Averages That You See in the Fatty Acid Synthase Paper There Are Also 3d Structures in the Paper So How Do You Go from from Information like this to a 3d Structure So I Mentioned One Way Is if You've Got Lots of Different Orientations of the Molecule on the Grid

So this Is Actually a Fairly Old Method I Think It's It's Still Widely Used and Very Elegant because It's Basically Just Two Images of the Same Thing and Then You Can Get a Reconstruction That's Pretty Easy To Get Out There's There's a One Disadvantage to this Approach One Major Disadvantage Which Is that You Can Only Tilt the Stage So Far So if You Could Tilt the Stage up to 90 Degrees Then You Would Have Views Exactly All the Way Around and You Could Have a Reconstruction That that's Sort Of Fully Complete in this Case You Can Only Tilt 270 Degrees and So You've Got Sort of

a Missing Cone of Information in the Reconstruction

The Key to a Sole Synthase in the Melon Oil Transferase They've Sort Of Come Up Close to Where the Acyl Carrier Protein Would Be so You Could Say and at the Same Time this Side Is Sort Of Closed Off so It Would Have a Harder Time Doing Processing on this Side So at the Same Time over Here the Sides Opened Up the Acyl Carrier Protein Can Easily Get In Here To Do the Processing but these Enzymes over Here Are out of Reach of the Elongation Enzymes So What this Means Is like One Side Could Be Elongated while the Other Sides Processing

We Can Tell the Difference between whether the Lower Portion Has Flipped 180 Degrees Relative to the Top or Not because It Would Look the Same but the Fact that We Can See these Go 90 Degrees Is Suggestive that that It Could Probably Unravel and Go the Rest of the Way Around So in the Crystal Structure the Way It Had Them Is They Were Sort Of Coiled like this and So It's Pretty Easy To Imagine that They Were Just Sort Of Uncoil One Other Line of Evidence That I Think Is Telling so Our Collaborator Has Made a Mutant That Has all of the Active Sites and the Acyl Carrier Protein Knocked out of One Subunit

Cryo-Electron Microscopy (Scientific Standards Hub) - Cryo-Electron Microscopy (Scientific Standards Hub) by Frederick National Laboratory for Cancer Research - Leidos Biomedical Research, Inc. 145 views 1 year ago 2 minutes, 8 seconds - Cryo-**electron microscopy**, or cryo-EM, is **a**, growing imaging technology that allows **visualization**, of **macromolecular assemblies**, in ...

What is Cryo-Electron Microscopy (Cryo-EM)? - What is Cryo-Electron Microscopy (Cryo-EM)? by UC San Francisco (UCSF) 137,841 views 8 years ago 2 minutes, 37 seconds - <http://www.ucsf.edu/news/2015/05/129836/resolution-revolution-building-better-micro-scope>, -see-atomic-level There are ...

What is Cryo EM?

Studying structural biology in intact cells by cryo electron microscopy - W Baumeister, ICCB 2018 - Studying structural biology in intact cells by cryo electron microscopy - W Baumeister, ICCB 2018 by CSIR - Centre for Cellular and Molecular Biology 1,005 views 5 years ago 46 minutes - Biochemists, so far, have mostly studied **the**, cellular machines - **the**, proteins, in isolation from **the**, other interactors. However, in **a**, ...

Cryo-Electron Tomography

Principles of Cryo-Electron Tomography

Radiation Sensitivity of Biological Samples

Denoising

Focused Ion Beam Milling

Face Plate

Nuclear Pore Complexes

The Nuclear Periphery

Nuclear Lamina

Protein Degradation

Protein Degradation Pathway

Hippocampal Neurons

Degradation Centers

Vitrification

The Symptoms of Als

Public Lecture | Cryo-EM: Amazing 3-D Views of Life's Molecular Machines - Public Lecture | Cryo-EM: Amazing 3-D Views of Life's Molecular Machines by SLAC National Accelerator Laboratory 6,284 views 5 years ago 1 hour, 29 minutes - Description: Cryogenic **electron microscopy**, (cryo-EM) is **a**, revolutionary technology for making 3D images of **the**, inner workings of ...

Intro

What Is a Molecular Machine?

Protein Folding Machine

Size of Objects

Transmission Electron Microscope

Hurdles to Use Electron Microscope for Biological Specimens

Electron Radiation Damage

What is Cryo-Electron Microscopy (Cryo-EM)

Cryo-EM Workflow

Cryo-EM: 2017 Nobel Prize in Chemistry

Commercial Direct Detector Technology

Movie-Mode Imaging

Assembly Process for ds-DNA Viruses Outside and Inside the Host Bacterium
Direct Electron Detector (DE20) Image of P22 Bacteriophages Embedded in Ice
3.3 A Cryo-EM Structure of P22 Bacteriophage
De Novo Model of Single Protein Subunit of P22 Bacteriophage
Full Atom Modeling of P22 Capsid Protein
Models of 7 Subunits in an AU of P22 Phage
Inter-Protein Subunit Interactions via N termini Across Hexons
Interactions Between Adjacent Proteins Within a Hexon or a Penton Via Salt Bridges
Cryo-EM of Mature P22 Bacteriophage
7A Cryo-EM Structure of P22 Bacteriophage
P22 Phage Before & After Packaging dsDNA
P22 Procapsid and Mature Phage Structures
Conformational Changes in Capsid Proteins
P22 Bacteriophage Expansion Upon Maturation
Interactions between Scaffolding and Coat Proteins in P22 Procapsid
Conventional Cryo-EM of Cell
Zernike Phase Contrast Cryo-EM of Cell
Principle of Electron Cryo-Tomography
Zernike Phase Contrast Cryo-ET of Cyanobacteria Infected with Cyanophage
ZPC Cryo-ET of Syn5 Infected Cell at Various Stages of Infection
Five Types of Syn5 Particles Classified from Subtomograms in the Cell
Opportunities of Cryo-EM for Research in Biomedical Sciences
Investigating the dynamics of molecular machines using automated electron microscopy - Investigating the dynamics of molecular machines using automated electron microscopy by Scripps Research
595 views 9 years ago 46 minutes - Presented by Bridget Carragher, Professor at **The**, Scripps Research Institute and Director of **the**, National Resource for Automated ...
Introduction
Welcome
Transmission electron microscopy
Resolution in electron microscopy
What can we do
phage tails
work
timelapse
onion Robert
Limitations
Improvements
Goals
Specimen preparation
Time to change
First prototype
Demonstration
Grids
Imaging
Atomic resolution
Translationally corrected images
Acknowledgement
Ohad Medalia (University of Zürich) Basic principle in three-dimensional electron microscopy - Ohad Medalia (University of Zürich) Basic principle in three-dimensional electron microscopy by Israel Institute for Advanced Studies 393 views 8 years ago 59 minutes - Ohad Medalia (University of Zürich) Basic principle in **three,-dimensional electron microscopy**,.
Electron Tomography
Low Resolution
High-Pressure Freezer
Adhesion Machinery
Correlative Microscopy
Resolution of Individual Tomogram
Adhesion
Platelets

Missing Wedge Effect

High Pressure Freezing

Accelerating Scientific Discovery using Electron Microscopy and Molecular Modeling - Accelerating Scientific Discovery using Electron Microscopy and Molecular Modeling by SCInstitute 977 views 12 years ago 1 hour, 10 minutes - Computational screening is **the**, name given to **the**, computer docking of **three-dimensional**, models of drug-like compounds into ...

Acknowledgements

Structure Elucidation from Imaging

Quasi Atomic Models via Single Particle Cryo-EM

Single Particle Cryo-EM Reconstruction

3D EM Reconstruction and Structure Elucidation

Single Particle Cryo-EM: Automatic Structure Elucidation

Secondary Structure Elucidation (I)

Challenge #2: Analysis of Molecular Function Computational Problems

Algebraic Spline: Triangular Free-form Prisms

Born Radii Approximation

SCALABILITY with Accuracy-Speed Tradeoff

Neurotoxins 101: Snake Venoms

The Chemical Synapse at the Neuro-Muscular Junction

Free Energy & Binding Free Energy

Conformational Docking/Binding

Translational Search using FFT (alternatively nFFT)

Benchmark Dataset and Measures of Performance

Computers and Science for Accelerated Drug Discovery

Verification & Validation

A 3-D Cell Reconstructed with Electron Microscopy - A 3-D Cell Reconstructed with Electron Microscopy by The Explorer's Guide to Biology 661 views 3 years ago 7 minutes, 29 seconds - Jennifer Lippincott-Schwartz describes Focused Ion Beam Scanning **Electron Microscopy**, (FIB-SEM) and **its**, application to cell ...

High-resolution 3D electron microscopy: Progress and new opportunities - High-resolution 3D electron microscopy: Progress and new opportunities by International Union of Crystallography 3,335 views 7 years ago 25 minutes - Plenary Lecture by Sriram Subramaniam. Biennial Meeting of **the**, British Biophysical Society, Liverpool, 6 July 2016. Recent ...

Intro

nature methods

Cryo-EM looks easy

Crossing the "sound" barrier: the trek beyond 3 Å resolution

Mapping ligand interactions: PETG localization

Glutamate receptor gating cycle

Desensitized glutamate receptor at 3.8 Å resolution

Discovery of "desensitization ring"

AMPA/kainate receptor gating mechanism

CorA: 200 kDa magnesium channel

Structure of CorA in the Mg²⁺-bound state

Unexpected Symmetry Break Upon Gating

p97 AAA ATPase - A Moving Cancer Target

2.3 Å resolution cryo-EM structure of human p97 and mechanism of allosteric inhibition

Three co-existing p97 conformations

p97 - A Moving Cancer Target

Small Proteins, Impossible Targets?

Drug Localization by Cryo-EM in 145 kDa LDHB

Drug Localization by Cryo-EM in 93 kDa IDH1

Glutamate dehydrogenase, a dynamic enzyme

1.8 Å Resolution Structure of GDH by Cryo-EM

Emerging applications of cryo-EM to drug discovery

The cryo-EM revolution - The cryo-EM revolution by NIH VideoCast 2,239 views 5 years ago 1 hour, 1 minute - The, cryo-EM revolution Air date: Wednesday, April 11, 2018, **3**:00:00 PM Category: WALSH - Wednesday Afternoon Lectures ...

Intro

Imaging gaps in biology and medicine
 A research program to bridge the imaging gap
 Two modes of imaging with transmission electron microscopy
 Electron crystallography of 2D crystals of bacteriorhodopsin
 Electron crystallography of the oxalate transporter
 Structural biology of receptor arrays in intact cells
 Visualizing the bacterial genome in 3D
 Cryo-electron tomography of HIV
 Mechanisms of antibody neutralization and Env plasticity
 Cryo-EM of influenza virus and universal vaccine design
 Characterization of ZMapp cocktail antibodies bound to Ebola GP
 Focused ion beam scanning electron microscopy: 3D imaging of cells and tissue
 HIV transfer to fetal astrocytes
 Voyage into a melanoma cell
 Visualizing the muscle mitochondrial power grid
 Automated identification of mitochondrial networks and connectivity
 Crossing the "sound" barrier for cryo-EM resolution
 Mapping ligand interactions: PETG localization
 CorA: 200 kDa magnesium channel
 Unexpected Symmetry Break Upon Gating
 Cryo-EM structure of Csy CRISPR-Cas complex with bound dsDNA
 DNA binding induces dramatic change in pitch
 Cryo-EM structure of CENP-N complex with CENP-A nucleosome
 Advanced image processing methods to further improve cryo-EM resolution
 Amino acid sidechains at atomic resolution
 Cryo-EM of light-induced structural changes in seven-helix proteins
 The cryo-EM revolution: The dawn of a golden era
 "Cryo-EM" is a broad discipline
 Search filters
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 Spherical videos

Transmission electron microscopy (TEM) is a microscopy technique in which a beam of electrons is transmitted through a specimen to form an image. The specimen... 117 KB (15,013 words) - 21:56, 17 January 2024

Cryogenic electron microscopy Image resolution Frank, Joachim (2006). Three-dimensional electron microscopy of macromolecular assemblies: visualization of biological... 12 KB (1,121 words) - 10:41, 1 March 2024

Joachim (2006). Three-dimensional electron microscopy of macromolecular assemblies: visualization of biological molecules in their native state. Oxford:... 22 KB (2,737 words) - 21:23, 19 February 2024
 specifically 3-dimensional electron microscopy (3DEM), is gaining popularity in structural biology. The utility of transmission electron cryomicroscopy... 24 KB (3,034 words) - 02:29, 1 December 2023
 structure of RNA polymerase using high intensity X-rays from synchrotrons. Since then, cryo-electron microscopy (cryo-EM) of large macromolecular assemblies has... 87 KB (9,875 words) - 03:26, 12 March 2024

adapter molecules in binding pockets within the ribosome. The new polypeptide then folds into a functional three-dimensional protein molecule. Unicellular... 62 KB (6,354 words) - 09:56, 9 March 2024

bioinformatics is the branch of bioinformatics that is related to the analysis and prediction of the three-dimensional structure of biological macromolecules such... 35 KB (3,534 words) - 02:46, 1 February 2024

are macromolecular machines, found within all cells, that perform biological protein synthesis (messenger RNA translation). Ribosomal RNA is found in the... 65 KB (7,277 words) - 01:53, 14 February 2024

Chemistry for his work in FT NMR, including multi-dimensional FT NMR, and especially 2D-FT NMR of small molecules. Multi-dimensional FT NMR experiments were... 78 KB (9,987 words) - 16:35, 17

February 2024

systems nanothermodynamics: a simple macromolecular partition problem with a statistical perspective". Journal of Biological Physics. 38 (2): 201–207. doi:10... 38 KB (4,340 words) - 17:26, 4 January 2024

with almost all proteins, the visualization of T3SS NCs is only possible with electron microscopy. The first images of NCs (1998) showed needle structures... 46 KB (5,859 words) - 21:34, 15 January 2024

class of proteins and their discovery has disproved the idea that three-dimensional structures of proteins must be fixed to accomplish their biological functions... 52 KB (5,993 words) - 08:01, 12 March 2024

use of cryo-electron microscopy and synchrotron radiation have recently allowed increasing resolution and better understanding of the nature of the interactions... 150 KB (17,979 words) - 12:44, 12 February 2024

small chemical systems to large biological molecules and material assemblies. Membrane biophysics is the study of biological membrane structure and function... 19 KB (2,012 words) - 14:04, 3 December 2023

enzymes and large macromolecular assemblies Refinement and dynamics of low-resolution structural data, e.g. Cryo-electron microscopy Molecular replacement... 36 KB (4,574 words) - 09:39, 22 February 2024

structure and function of large macromolecular complexes, in particular membrane proteins and their assemblies, complexes involved in signal transduction... 118 KB (15,450 words) - 23:32, 2 January 2024

including the movement of secretory vesicles, organelles, and intracellular macromolecular assemblies. They are also involved in cell division (by mitosis... 64 KB (7,838 words) - 06:58, 22 February 2024

cryogenic electron tomography and obtaining biological insights into large macromolecular assemblies, especially the proteasome, and proteins involved in neurodegeneration... 3 KB (335 words) - 22:55, 17 July 2023