C-flat™
Bibliography — Journal Articles

Drosophila A Virus is an Unusual RNA Virus with a T=3 Icosahedral Core and Permuted RNA-dependent RNA Polymerase
R. L. Ambrose, G. C. Land, W. S. Maaty, B. Bother, J, E. Johnson and K. N. Johnson
C-flat carbon grids were used in cryo-electron microscopy to investigate the structure of the Drosophila A virus (DAV). It was revealed that two distinct domains exist for the protein structure.

Functionalized Silicone Nanospheres: Synthesis, Transition Metal Immobilization, and Catalytic Applications
C. A. Bradley, B. D. Yuhas, M. J. McMurdo and T. Don Tilley
Nanospheres in the size range of 12-28 nm containing functional groups were prepared from copolymerization of Methylvinylketone and 2-Isocyanatobutyric acid. Samples were dissolved in methyl chloride and imaged on C-flat carbon grids with TEM.

Functional Domain of the Bacteriophage P2 Scaffolding Protein: Identification of Residues Involved in Assembly and Protease Activity
J. R. Chang, M. S. Spilman, C. M. Rodenmund and T. Dordick
Virology, v384, pp144, 2009
The bacteriophage P2 was observed using C-flat carbon grids with cryo-electron microscopy. The 284 residue gP0 was imaged and its proteolytic activity was characterized.

Assembly of Bacteriophage P2 Capsid From Capsid Protein Fused to Internal Scaffolding Protein
J.R. Chang, M.S. Spilman and T. Dordick
Virus Genesis, v40, pp208, 2010
The C-terminal scaffolding domain of the gP0 capsid protein was fused with the gPP capsid protein in the bacteriophage M97 to determine its potential use as a delta capsid. C-flat carbon grids were used in cryo-electron microscopy to determine conformational variability.

Does contamination buildup limit throughput for automated cryoEM
A. Cheng, D. Fellmann, J. Pulikos, C. S. Potter and B. Carragher
C-flat carbon grids were used to measure ice contamination buildup on TEM grids. C-flat grids were maintained for long durations in side entry cryo stages and imaged to determine the extent of the ice layer buildup.

Ultramicroscopy, v107, pp685, 2007
A cost effective way of molding poly(dimethylhydrosiloxane) elastomer stamps and printing holey patterns on plastic film was developed. The method involveys floating the film onto TEM grids, evaporating carbon onto the film, and plastic removal.

Chaperonin Complex With a Newly Folded Protein Encapsulated in the Folding Chamber
D. R. Clark, P. J. Bakkes, H. van Heerdenzoon, S. M. van der Heer and H. R. Salem
Cryo-electron microscopy using C-flat carbon grids were used to study chaperonin complexes of denatured gp23 and GroEL. Structures of the initial and final closed state of the complex were presented.

Multiple States of a Nucleotide-Bound Group 2 Chaperonin
D. Clark, S. Stegg, J. Quinse, G. Farr, A. Horevich and H. Salem
Structure, v16, pp528, 2008
Nucleotide binding to a homo-oligomeric group 2 chaperonin from Methanococcus maripaludis (Mm) was investigated using cryo-electron microscopy. The open and closed stages of the chaperonin complex, either alone or with ADP, were imaged on C-flat carbon grids.

Cryo-Electron Tomography of Structure of Flexible Filamentous Plant Viruses
J. Cope, S. Gilbert, I. Rayment, D. Mastromonte and A. Hoogen
C-flat carbon grids were used in cryo-electron tomography to investigate microtubule structures. Three dimensional images of kinesin motor complexes, the monomeric Eg5 and heterodimers, Kar3/1 motor were generated.

Molecular Organization of Gram-Negative Peptidoglycan
L. Gao, S. Chen and G. J. Jensen
PNAS, v105, pp1953, 2008
The layered structure of the succus, a peptidoglycan, in bacteria was examined using electron cryotomography. The succus specimens were mixed with 10 nm colloidal gold beads and were observed on C-flat carbon grids.

Preparation of macromolecular complexes for cryo-electron microscopy
R. A. Grassucci, D. J. Taylor and J. Frank
Nat. Protoc., v2, pp329, 2007
A protocol for coating grid surfaces with a holey carbon film using a Former film template was described. Methods for depositing a homogeneous sample through plunge freezing with cryogen were also discussed.

Electro Cryo-Microscopy and Single-Particle Averaging of Rift Valley Fever Virus: Evidence for GN-GC Glycoprotein Heterodimers
J. Virol., v83, pp1762, 2009
C-flat carbon grids were used to study the structural units of the Rift Valley fever virus (RVFV). Glycoprotein capsomers were analyzed with cryo-microscopy and 3D images were constructed.

Structure of Flexible Filamentous Plant Viruses
J. Virol., v82, pp5546, 2008
C-flat carbon grids were used to study the structural units of the Rift Valley fever virus (RVFV). Glycoprotein capsomers were analyzed with cryo-microscopy and 3D images were constructed.

Structure of Flexible Filamentous Plant Viruses
J. Virol., v82, pp5546, 2008
Cryo-electron microscopy, using C-flat carbon grids, was used to discover the symmetry of two plant viruses, potyvirus and potexvirus. The purified virions were applied to C-flat grids and imaged with cryo-electron microscopy.

Preparation and Characterization of Bio-Nanocomposite Films Based on Soy Protein Isolate and Montmorillonite: Singlet Extrusion
P. Kumar, K.P. Sandeep, . S. Anil, V.D. Triipong and E.G. Ganga
J. Food Eng., v100, pp480, 2010
The morphology of bio-nanocomposite films, potentially used as plastic packaging material, was studied. The SPAMMT bio-nanocomposite films were ground into powder and analyzed with TEM using C-flat carbon grids.

Bacteriophage Lambda Stabilization by Auxiliary Protein gp20: Timing, Location, and Mechanism of Attachment Determined by CryoEM
Structure, v16, pp199, 2008
The bacteriophage lambda was prepared on C-flat carbon grids for analysis with cryo-EM. The 2D-A-capid containing the gP20a genome was observed to analyze capsid stabilization.

Architecture of a Nascent Viral Fusion Pore
K. K. Lee
The EMBO Journal, v29, pp1299, 2010
C-flat carbon grids were used in cryo-electron tomography to investigate proteins used for virus-cell adhesion. Three dimensional images of the Haemagglutinin fusion glycoproteins from the influenza virus were created and studied.

Colloidal Amphiphile Self-Assembly Particles Composed of Goldisomine Oxide and Myxvol: Evaluation as Contrast Agents for Magnetic Resonance Imaging
G. Li, C. E. Conn, L. J. Waddington, S. T. Mudie and C. J. Drummon
Magn. Reson. med., v26, pp2383, 2010
The morphology of bio-nanocomposite films, potentially used as plastic packaging material, was studied. The SPAMMT bio-nanocomposite films were ground into powder and analyzed with TEM using C-flat carbon grids.

Native 3D intermediates of Membrane Fusion in Herpes Simplex Virus 1 Entry
U. E. Maurer, S. Sodeik and K. Grunewald
PNAS, v105, pp10519, 2008
The bacteriophage lambda was prepared on C-flat carbon grids for analysis with cryo-EM. The 2D-A-capid containing the gP20a genome was observed to analyze capsid stabilization.

Hydrocarbon lithography on graphene membranes
J. C. Meyer, C.O. Girit, M.F. Crommie and A. Zettl
A method of depositing arbitrary patterns of hydrocarbons on graphene membranes was investigated using C-flat carbon grids. Graphene membranes with the deposited carbon can be used as microelectronic material.

Direct Imaging of Lattice Atoms and Topological Defects in Graphene Membranes
J. C. Meyer, C. Klabowski, R. Erni, M. D. Rossat, M. F. Crommie and A. Zettl
Graphene membranes, crystalline foils one atom thick, were resolved using C-flat holey carbon grids. Individual atoms and Stone-Wales defects could be observed in situ.

Graphene oxide: A substrate for optimizing preparations of frozenhydrated samples
J. Struct. Biol., v170, pp152, 2010
The use of graphene oxide as a macromolecular substrate for electron microscopy was investigated using C-flat carbon grids. Graphene oxide was applied to the grids and imaged with TEM.
<table>
<thead>
<tr>
<th>Title</th>
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<tr>
<td>Visualization of 80S Ribosomes in situ Using Cryo Electron Tomography of Vitreous Sections</td>
<td>J. Pearson, J.J. Fernández, E. Bois, H. Gnieg, L.L. Carrascosa, M. Vos and P.J. Peters</td>
<td>EMC 2008 14th European Microscopy Congress, vol. 3, 2008</td>
<td>C-flat holey carbon grids were used in cryo-electron tomography to examine the native structure of the 80S ribosome. High resolution reconstructions were possible through a technique of that allowed for quality alignment of images using markers on the carbon film.</td>
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<tr>
<td>Improved Holey-Carbon Film for Cryo-Electron Microscopy</td>
<td>J. Quispe, J. Dammann, S. E. Mikk, D. P. Mackay, D. Fellmann, T. G. Aijen, B. Carragher and C. S. Potter</td>
<td>Microsc. Microanal., v15, pp565, 2007</td>
<td>An improved method over consumable templates with soft material, a method for incorporating a holey carbon film over a hard template was described. These carbon films have improved purity and flatness with greater distribution of single particles in vitreous ice without residue accumulation affecting imaging through cryo-electron microscopy.</td>
</tr>
<tr>
<td>Micromachining Tools and Correlative Approaches for Cryo-Electron Tomography</td>
<td>A. Rigort, F.B. Buerlein, A. Leis, M. Grauer, C. Hoffmann, T. Laugraf, U.B. Hm, M. Elbacar, H. Gnieg, W. Baumeister and J. M. Plitzko</td>
<td>J. Struct. Biol., v172, pp169, 2010</td>
<td>C-flat holey carbon grids were used to demonstrate focused ion beam instrumentation as a method of thinning frozen specimens without mechanical deformation. A novel method of mixing vitreous ice, cryo-plating, was also introduced.</td>
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<tr>
<td>Solubilization of Sapogeline, a Poorly Water-Soluble Anticancer Drug, Using Polymeric Micelles for Parenteral Delivery</td>
<td>A. Richter, C. Obrich, M. Krause and T. Kissel</td>
<td>Int. J. Pharm., v189, pp244, 2010</td>
<td>C-flat carbon grids were used in cryo-electron microscopy to polymeric micelles used as a drug delivery mechanism for the cancer drug Sapogeline. Characteristics of the polymers, such as size, solubility, and stability were investigated.</td>
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<tr>
<td>The Holin of Bacteriophage Lambda Forms Rings With Large Diameter</td>
<td>C. G. Savva, J. S. Dwyer, J. Deaton, R. L. White, D. K. Strauss, A. Hohsren and R. Young</td>
<td>Mol. Microbiol., v65, pp784, 2008</td>
<td>Cryo-electron microscopy and single particle analysis was used to characterize the bacteriophage λ holin (S105). Negatively stained protein samples were imaged on C-flat carbon grids.</td>
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<tr>
<td>Mitochondrial Outer Membrane Proteins Assist Adi in Ben-methylated Lipidic Pure Formation</td>
<td>B. Schuler, J. Quispe, V. Choudhary, J.E. Chipuk, T.G. Aijen, H. Du, R. Schneiter and T. Kuehne</td>
<td>MolCell in Press, vol. 20, pp. 2276-2285, 2009</td>
<td>Cardiolipin-liposomes were applied to C-flat holey carbon grids and imaged with cryoEM. This led to the understanding of the role of cardiolipin in mitochondrial outer membrane permeabilization.</td>
</tr>
<tr>
<td>Segosome Structure Revealed by a Complex of Par with Centromere DNA</td>
<td>M. A. Schumacher, T. C. Glover, A. J. Brassas, S. O. Jensen, T. D. Dunham, R.A. Skurray and N. Firth</td>
<td>Nature, v450, pp1268, 2007</td>
<td>The structure of the Par-DNA complex was imaged on C-flat carbon grids with STEM. Specifically, the p56K41 segosome structure was revealed.</td>
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<tr>
<td>Structure of the Mitochondrial Transmembrane Reversal Segosome Using Electron Cryo-Microscopy</td>
<td>Jani J. Seitzemona, Petri Sсуд, Anni Lemmetty and Sarah J. Butcher</td>
<td>Virology, v578, pp162, 2008</td>
<td>The structure of the Blackcurrant Reversal Nepovirus (BRV) was determined through cryo-electron microscopy. Viral samples were loaded onto C-flat carbon grids and analyzed with image reconstruction.</td>
</tr>
<tr>
<td>The Structure of Western Equine Encephalitis Virus</td>
<td>M.B. Sherman and S.C. Weaver</td>
<td>Microsc. Microanal., v14, pp1584, 2008</td>
<td>A suspension of Western Equine Encephalitis Virus particles was applied to C-flat carbon grids and imaged using cryoEM. This was the first successful attempt at imaging this alphavirus with electron microscopy.</td>
</tr>
<tr>
<td>Automated CryoEM Data Acquisition and Analysis of 294 742 Particles of GroEL</td>
<td>S. M. Stagg, G. C. Lander, J. P. Fokas, D. Fellmann, A. Cheng, J. D. Quispe, S. P. Matlock, R. M. Amla, B. Carragher and C.S. Potter</td>
<td>J. Struct. Biol., v155, pp470, 2006</td>
<td>An automated procedure for 3D imaging was demonstrated that increases the speed and ease of acquiring macro molecular images. C-flat carbon grids were loaded with GroEL protein and 3D maps were generated from a series of image acquisitions.</td>
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<tr>
<td>An Improved Cryogen for Plunge Freezing</td>
<td>W. F. Tovilla, A. Briedge, and G. J. Jensen</td>
<td>Microsc. Microanal., v14, pp375, 2008</td>
<td>An equal mixture of propane and ethane is demonstrated as being a superior cryogen when compared with others. It was shown that damage to the substrate of C-flat carbon grids was greatly reduced with this method.</td>
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<td>Automation of Random Canonical Tilt and Orthogonal TR Data Collection Using Feature-Based Correlation</td>
<td>C. Yoshioka, J. Pulokas, D. Fellmann, C. S. Potter, R. A. Mihaylova and B. Carragher</td>
<td>J. Struct. Biol., v159, pp335, 2007</td>
<td>An automated method of random conical and orthogonal tilt (RCT/ORT) that reduced the need for difficult manual collection and increases quality of images was investigated. The GroEL chaperone complex was imaged on C-flat carbon grids.</td>
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<tr>
<td>Contrast Transfer Function Correction Applied to Cryo- Electron Tomography and Sub-Tomogram Averaging</td>
<td>G. Zanelli, J. D. Riches, S. D. Fuller and J. A.G. Briggs</td>
<td>J. Struct. Biol., v168, pp305, 2009</td>
<td>C-flat carbon grids were used in cryo-electron tomography to image PRD1 bacteriophages. Methods for improving image resolution were tested.</td>
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<tr>
<td>Near-Atomic Resolution Using Electron Cryo-microscopy and Single-Particle Reconstruction</td>
<td>X. Zheng, E. Settembre, C. Xu, P.R. Dormitzer, R. Bellamy, S.C. Harrison and N. Gronenfeld</td>
<td>EMRS, v15, pp169, 2007</td>
<td>The rotavirus inner capsid particle was imaged on C-flat carbon grids through single particle electron microscopy. The high resolution capabilities of single particle analysis were discussed.</td>
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