CURRICULUM VITAE

Wah Chiu, Ph.D.

Wallenberg-Bienenstock Professor

Department of Bioengineering, School of Engineering/Medicine

Department of Microbiology and Immunology, School of Medicine (by Courtesy)

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Education

1969	B.A. in Physics, University of California, Berkeley
1973	Research Visitor, High-Voltage Electron Microscope Group, Cavendish Laboratory, Cambridge University, Cambridge, United Kingdom
1975	Ph.D. in Biophysics, University of California, Berkeley

Current Positions

2017 - present	Professor of Bioengineering, Microbiology and Immunology (by courtesy), and Photon Science, Stanford University
2018 - present	Director, CryoEM and Bioimaging Division, SSRL, SLAC National Accelerator Laboratory
2018 - present	Founding Director, Stanford-SLAC CryoEM Center (S^2C^2), SSRL, SLAC National Accelerator Laboratory

2020 - present	Founding Director, Stanford-SLAC CryoET Specimen Preparation Service Center (SCSC)
2020 - present	Wallenberg-Bienenstock Professor, Stanford University

Previous Positions

1975 - 1977	Postdoctoral Research Associate, University of California, Berkeley, California
1977 - 1979	Biophysicist, Lawrence Berkeley Laboratory, University of California, Berkeley, California
1979 - 1983	Assistant Professor, Department of Cellular and Developmental Biology, University of Arizona, Tucson, Arizona
1983 - 1988	Associate Professor, Department of Biochemistry and Department of Molecular and Cellular Biology, University of Arizona, Tucson, Arizona
1986 - 1987	Visiting Professor, MRC Laboratory of Molecular Biology, Cambridge, United Kingdom
1988 - 2020	Founding Director, National Center for Macromolecular Imaging, Baylor College of Medicine and Stanford University
1990 - 2016	Founding Co-Director, W. M. Keck Center for Computational Biology, Baylor College of Medicine and Rice University, (University of Houston, University of Texas Houston Medical School, MD Anderson Cancer Center, and University of Texas Galveston Medical Branch subsequently joined)
1993 - 2016	Founding Director, Graduate Program in Structural and Computational Biology and Molecular Biophysics, Baylor College of Medicine
1996 - 1997	Visiting Professor, Max-Planck-Institut für Biochemie, Martinsried, Germany
1999	Visiting Professor, Department of Biophysics, Kyoto University, Kyoto, Japan
2011 - 2012	Visiting Professor, King Saud University, Riyadh, Saudi Arabia
2008 - 2015	Visiting Professor, Department of Biological Sciences, National University of Singapore, Singapore
2001 - 2015	Adjunct Professor, University of Texas School of Biomedical Informatics
2005 - 2016	Founding Director, Center for Protein Folding Machinery: Baylor College of Medicine, Stanford University, University of California San Francisco, University of California San Diego, University of California Irvine, Massachusetts Institute of Technology, M.D. Anderson Cancer Center and Lawrence Berkeley National Laboratory
1988 - 2017	Professor, Departments of Biochemistry and Molecular Biology, Molecular Virology and Microbiology, and Molecular and Cell Biology, Baylor College of Medicine, Houston, Texas
1991 - 2017	Professor, Department of Molecular Physiology and Biophysics, Baylor College of Medicine, Houston, Texas
1996 - 2017	Alvin Romansky Chair Professor of Biochemistry, Baylor College of Medicine
2002 - 2017	Adjunct Professor of Physics, University of Houston
2004 - 2017	Adjunct Professor of Computer Science, Rice University
2010 - 2017	Distinguished Service Professor, Baylor College of Medicine
2017 - 2019	Adjunct Professor, Baylor College of Medicine

Honors

1972	Award of Merit, Oakland City Council
1974	Presidential Scholar of Electron Microscopy Society of America
1986	Guggenheim Fellow
1986	Visiting Fellow, Clare Hall, Cambridge University, Cambridge
1996	Alexander von Humboldt Research Prize
1999	Research Fellow, Japan Society for the Promotion of Science
2003	Chinese Biophysicists Network Award
2006	Presidential Award, American Academy of Nanomedicine
2007	Profiles in Excellence, Alliance for NanoHealth
2008	Elected Academician, Academia Sinica, Taiwan
2010	Distinguished Service Professorship, Baylor College of Medicine
2011	Achievement Award, Society of Chinese Bioscientists in America Houston Chapter
2012	Elected Member, United States National Academy of Sciences
2013	Elected Member, The Academy of Medicine, Engineering, and Science of Texas
2013	Distinguished Faculty Award, Baylor College of Medicine Alumni Association
2014	Honorary Doctorate of Philosophy, University of Helsinki, Finland
2014	Distinguished Scientist Award for the Biological Sciences, Microscopy Society of America
2015	Barbara and Corbin J. Robertson Jr. Presidential Award for Excellence in Education, Baylor College of Medicine
2020	Inaugural Wallenberg-Bienenstock Endowed Professor, Stanford University
2021	M. J. Buerger Award, American Crystallography Association

Professional Experience (partial)

2006 - 2009	Chair, Gulf Coast Consortia for Collaborative Research with faculty membership from Baylor College of Medicine, Rice University, University of Houston, University of Texas Houston Medical School, M.D. Anderson Cancer Center, and University of Texas Galveston Medical Branch
2007	Member, Strategic Planning Committee, National Center for Research Resources, National Institutes of Health
2007 - 2008	Member, Advisory Board, National Research Program for Genomics Medicine, Academia Sinica, Taiwan
2007 - 2012	Member, Advisory Board, HIV Structural Biology Program, National Institute of General Medical Sciences, National Institutes of Health
2007 - 2015	Member and Chair (2012-2015), Expert Panel for Biomedical Engineering & Life Sciences Cluster, Singapore Ministry of Education
2007 - 2015	Member, Panel for SystemsX, Research Council of the Swiss National Science Foundation
2010	Member, Advisory Board, Nanotechnology Program, National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health
2010 - 2013	Member, Advisory Board, Structural Genomics Program, National Institute of General Medical Sciences, National Institutes of Health
2010 - 2015	Member, Board of Scientific Counselors, National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

2010 - 2018	Member, Advisory Board, Integrated Structural Biology Infrastructure for Europe (INSTRUCT)
2011 - 2017	Member, Scientific Advisory Board, Institute of Biological Chemistry Institute, Academia Sinica, Taiwan
2011 - 2013	Reviewer, European Research Council Executive Agency (ERCEA), Brussels
2012 - 2017	Member, Scientific Advisory Board, Michael E. DeBakey VA Medical Center, Houston
2013 - 2014	Member, NIGMS Committee on Protein Science Initiative Transition Strategy
2013 - 2017	Member, Scientific Advisory Board, Max Planck Institute of Biochemistry in Martinsried, Germany
2015 - 2016	Member, Scientific Advisory Board, Division of Structural Biology, St. Jude Children's Research Hospital
2016	Ad Hoc Member, Board of Scientific Counselors, National Institute of Allergy and Infectious Diseases, National Institutes of Health
2014 - 2023	Member, Scientific Advisory Board, BioXFEL Center, University of Buffalo
2016 - 2020	Member, Scientific Advisory Board, Biozentrum, Universität Basel, Basel, Switzerland
2019 - 2023	Member, Scientific Advisory Board, Advanced Photon Source, Argonne National Laboratory
2021 - 2023	Member, Steering Council, Chan Zuckerberg Initiative, Visual Proteomics Imaging
2005 - Present	Member, Advisory Board, RCSB Protein Data Bank, Rutgers University
2010 - Present	Member, Advisory Committee, world-wide Protein Data Bank (wwPDB)
2018 - Present	Member, Scientific Advisory Board, Institute of Molecular Biology, Academia Sinica, Taiwan
2022 - Present	Member, Scientific Advisory Board, UniProt
2022 - Present	Member, Scientific Advisory Board, RUEDI (Relativistic Ultrafast Electron Diffraction & Imaging), UK
2024 - Present	Member, Board of Scientific Counselor, National Institute of Diabetes, Digestive and Kidney Diseases, National Institutes of Health
2024 - Present	Shenzhen Medical Academy of Research and Translation (SMART) Ad Hoc Member, Board of Scientific Counselor, National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

Current Editorships

1997 - Present	Member, Editorial Board, *Journal of Microscopy and Microanalysis*
2004 - present	Member, Advisory Board, *Structure*
2008 - Present	Associate Editor, Editorial Board, *Quarterly Reviews of Biophysics*
2015 - Present	Member, Editorial Board, *Quarterly Reviews of Biophysics Discovery*

Conferences/Symposia/Workshops Organized (Partial List)

2005	Session Chair, NIGMS Symposium on Structural Analysis of Large Macromolecular Assemblies: Sizing Up the Challenge, Bethesda
2005	Chair, Annual NCRR Principal Investigators Conference, Bethesda
2005	Session Chair, Hybrid Methods, XX Congress of the International Union of Crystallography, Florence, Italy

2006	Session Chair, International Summer School in Crystallography, Sicily, Italy
2006	Chair, Cryo-EM Workshop, Houston, Texas
2006	Session Chair, 3-D EM Gordon Conference, Italy
2006	Session Chair, American Chemical Society Conference, Houston
2007	Chair, Symposium on Structural Biology in Cancer Research, Houston
2007	Chair, Symposium on Nanomedicine, Biophysical Society, Baltimore
2007	Co-chair, Single Particle Image Processing Workshop, Houston
2007	Chair, Grand Challenges in Nanomedicine Workshop, Houston
2008	Chair, Translational Nanomedicine Workshop, Houston
2008	Chair, Cryo-EM workshop, Sun Yat-sen University, Guangzhou, China
2008	Co-chair, Single Particle Image Processing Workshop, Houston
2009	Chair, Cryo-EM based modeling workshop, Houston
2009	Co-chair, Cryo-EM workshop, London
2009	Chair, Pacific Rim Bioimaging Symposium, Hong Kong
2010	Chair, Modeling cryo-EM Maps, Houston
2010	Co-chair, Animation Workshop, UCSF
2010	Chair, Nanomedicine Mini symposium, Biophysical Society Meeting, San Francisco
2010	Co-chair, 6th International Symposium on Structural Biology and Functional Genomics, National Singapore University
2011	Co-chair, Model Validation Workshop, Annual Pacific Symposium on Biocomputing, Hawaii
2011	Co-chair, Single Particle Image Processing Workshop, NCMI, Houston
2011	Chair, Gulf Coast Consortia Annual Retreat
2012	Co-Chair, Structural Biology, Keystone Symposium, Keystone
2012	Co-organizer, 5th KH Kuo International Symposium on Structural Biology, China
2012	Chair, Cryo-Electron Microscopy Workshop, National University of Singapore, Singapore
2013	Chair, Cryo-Electron Microscopy Workshop, National Cheng Kung University, Taiwan
2013	Co-Chair, 4th Xiamen Structural Biology Annual Symposium, Xiamen, China
2014	Chair, First Cold Spring Harbor Symposium on Structural Biology, Suzhou, China
2015	Co-Chair, Image Processing Workshop and CryoEM Symposium, Houston, TX
2015	Chair, Symposium on How Can Understanding Protein Structure Help us Unravel the Mysteries of Neurodegenerative Disease? Neuroscience Annual Conference, Chicago, IL.
2016	Chair, Nanomedicine Symposium, MD Anderson Cancer Center, Houston, TX
2016	Chair, CryoEM Symposium, America Chemical Society, Galveston, TX
2017	Member, Advisory Board, Nobel Symposium on Protein Folding, Sweden
2018	Co-Chair, Cryo-EM Symposium American Crystallography Association, Toronto, Canada
2018	Member, Program Committee, 19th International Microscopy Congress, Sydney, Australia
2018	Co-Chair, Cryo-EM Symposium, International Congress of Cell Biology, Hyderabad, India
2025	Co-chair, Cryo-EM Next 50 Years, University of California, Berkeley.

2025	Co-organizer, The International Virus Assembly Farewell Symposium, Alghero, Sardinia, Italy
2026	Chair, Bay Area CryoEM Meeting, Stanford, CA
2026	Session Chair, Microscopy Society of America, Milwaukee, WI

Professional Societies/University Committees (Partial)

1984 - 1985	Elected President, Arizona Society of Electron Microscopy and Microbeam Analysis
1986 - 1988	Chairman, Task Force Committee on Cryo-microscopy Technology, Electron Microscopy Society of America
1989 - 1997	Member, Education Committee, Biophysical Society
1991 - 1992	Elected President, Society of Chinese Bio scientists in America, Houston Chapter
1995 - 1999	International Committee, Microscopy Society of America
1996 - 1999	Elected Membership Committee, Society of Chinese Bio scientists in America
2006 - 2010	Member, Board of Directors, American Academy of Nanomedicine
2011 - 2015	Council Member, American Society of Nanomedicine
2012	Member, Selection Committee, National Academy of Sciences Alexander Hollaender Award in Biophysics
2014	Member, Selection Committee for Foreign Member in Biophysics Section, National Academy of Sciences
2015	National Academy of Sciences Council Designee for the Class II CMC
2015	Member, Selection Committee, National Academy of Sciences Alexander Hollaender Award in Biophysics
2018	Chair, Selection Committee, National Academy of Sciences Alexander Hollaender Award in Biophysics
2019 - 2023	Faculty Promotion and Recruitment Committees, Stanford University

Past and Current Memberships of Professional Societies

American Association for the Advancement of Science
American Cell Biology Society
American Crystallographic Association
American Society for Virology
Biophysical Society
Microscopy Society of America
Society of Chinese Bio scientists in America
American Society of Microbiology
American Society of Nanomedicine

Courses Taught

Freshman introductory course in Cellular and Molecular Biology
Senior-level course in Supramolecular Structure
Graduate courses in Biophysical Techniques; Advanced Topics in Electron Microscopy; Physical Biochemistry; Biomembranes; Experimental Virology; Macromolecular Design and

Analysis; Molecular Biophysics; Structural Basis of Human Diseases; Advanced Molecular and Computational Biophysics; Structural Biology; Image Processing for Macromolecular Complexes; Computational Mathematics for Quantitative Biology; Cryogenic Electron Microscopy and Tomography

Publications (Papers)

Chiu, W. and Glaeser, R.M. (1975). Single-atom image contrast: Conventional dark-field and bright-field electron microscopy. *J Microsc,* **103:**33-54. PMID1095752.

Chiu, W. and Glaeser, R.M. (1977). Factors affecting high resolution fixed-beam transmission electron microscopy. *Ultramicroscopy,* **2:**207-217. PMID888240.

Chiu, W. and Hosoda, J. (1978). Crystallization and preliminary electron diffraction study to 3.7 Å of DNA helix-destabilizing protein GP 32*I. *J Mol Biol,* **122**:103-107.

Chiu, W. (1978). Factors in high-resolution biological structure analysis by conventional transmission electron microscopy. *Scanning Electron Microsc,* **1:**569-580.

Glaeser, R.M., Chiu, W. and Grano, D. (1979). Structure of the surface layer protein of the outer membrane of *Spirillum serpens*. *J Ultrastruc Res,* **66:**235-242. PMID439191.

Chiu, W. and Glaeser, R.M. (1980). Evaluation of photographic emulsion for low-exposure imaging. In *Electron Microscopy at Molecular Dimensions*, Eds. W. Baumeister and W. Vogell, Springer Verlag, Berlin, pp. 194-199.

Chiu, W. and Jeng, T.W. (1980). Electron diffraction study of crotoxin complex at 1.6 Å. In *Electron Microscopy of Molecular Dimensions*, Eds. W. Baumeister and W. Vogell, Springer Verlag, Berlin, pp. 137-142.

Downing, K.H. and Chiu, W. (1980). Effect of stray magnetic field on image resolution in transmission electron microscopy. *Ultramicroscopy,* **5:**351-356.

Chiu, W., Knapek, E., Jeng, T.W. and Dietrick, I. (1981). Electron radiation damage of a thin protein crystal at 4 K. *Ultramicroscopy,* **6:**291-296.

Cohen, H. and Chiu, W. (1981). Accumulated dose dependence of support film contrast transfer function. *Ultramicroscopy,* **6:**335-342.

Chiu, W. (1982). High-resolution electron microscopy of unstained, hydrated protein crystals. In *Electron Microscopy of Proteins,* Vol. II, Ed. J. R. Harris, Academic Press, London, pp. 233-259.

Chiu, W. and Jeng, T.W. (1982). Electron radiation sensitivity of protein crystals. *Ultramicroscopy,* **10:**63-70. PMID6753294.

Chiu, W., Rankert, D., Cumming, M.A. and Robinson, J.P. (1982). Characterization of crystalline filtrate tetanus toxin. *J Ultrastruc Res,* **79:**285-293. PMID7086947.

Kellenberger, E. and Chiu, W. (1982). Perspectives and outlook for electron microscopy in biology in general. *Ultramicroscopy,* **10:**165-177. PMID6182665.

Jeng, T.W. and Chiu, W. (1983). Low-dose electron microscopy of crotoxin complex thin crystal*. J Mol Biol,* **164:**329-346. PMID6842594.

Cohen, H.A., Chiu, W., and Hosoda, J. (1983). Structural analysis of T4 DNA helix destabilizing protein (gp32*I) crystal. *J Mol Biol,* **169:**235-248. PMID6312050.

Jeng, T.W. and Chiu, W. (1984). Experimental strategy in 3-dimensional structure determination of crotoxin complex thin crystal. *Ultramicroscopy,* **13:**27-34. PMID6474598.

Cohen, H.A., Grant, R.A., Jeng, T.W., and Chiu, W. (1984). Specimen preparative methods for protein electron crystallography. *Ultramicroscopy,* **13:**19-26. PMID6540906.

Jeng, T.W., Chiu, W., Zemlin, F., and Zeitler, E. (1984). Electron imaging of crotoxin complex crystal at 3.5 Å. *J Mol Biol,* **175:**93-97. PMID6726806.

Cohen, H.A., Schmid, M.F., and Chiu, W. (1984). Estimates of validity in projection approximation for three-dimensional reconstructions at high resolution. *Ultramicroscopy,* **14:**219-226. PMID6506323.

Jeng, T.W. and Chiu, W. (1984). Quantitative assessment of radiation damage in a protein crystal. *J Microsc,* **136:**35-44. PMID6512854.

Grant, R.A., Schmid, M.F., Chiu, W., Deatherage, J., and Hosoda, J. (1986). Alignment and merging of electron microscopy images of frozen, hydrated crystals of the T4 DNA helix destabilizing protein gp32*I. *Biophys J,* **49:**251-258. PMC1329629.

Chiu, W. (1986). Electron microscopy of frozen, hydrated biological specimens. *Ann Rev Biophys Biophys Chem,* **15:**237-257. PMID3087377.

Chiu, W., Downing, K.H., Dubochet, J., Glaeser, R.M., Heide, H.G., Knapek, E., Kopf, D.A., Lamvik, M.K., Lepault, J., Robertson, J.D., Zeitler, E., and Zemlin, F. (1986). Cryoprotection in electron microscopy. *J Microsc,* **141:**385-391.

Chiu, W., Jeng, T.W., Degn, L.L., and Prasad, B.V.V. (1986). Potential for high-resolution electron crystallography at intermediate high voltage. *Ann N Y Acad Sci,* **483:**149-156. PMID3471122.

Prasad, B.V.V. and Chiu, W. (1987). Sequence comparison of single-stranded DNA binding proteins and its structural implications. *J Mol Biol,* **193:**579-584. PMID3295261.

Talmon, Y., Prasad, B.V.V., Clerx, J.P.M., Wang, G. J., Chiu, W., and Hewlett, M. (1987). Electron microscopy of vitrified-hydrated La Crosse virus. *J Virol,* **61:**2319-2321. PMID3586135.

Jeng, T.W. and Chiu, W. (1987). High-resolution cryo-system designed for JEM 100 CX electron microscopy. *Ultramicroscopy,* **23:**61-66. PMID3660492.

Prasad, B.V.V., Wang, G.J., Clerx, J.P.M., and Chiu, W. (1987). Cryoelectron microscopy of spherical viruses: An application to rotavirus. *Micron Microsc Acta,* **18:**327-331.

Prasad, B.V.V., Wang, G.J., Clerx, J.P.M., and Chiu, W. (1988). Three-Dimensional structure of rotavirus. *J Mol Biol,* **199:**269-275. PMID2832610.

Jeng, T.W., Talmon, Y., and Chiu, W. (1988). A containment system for the preparation of vitrified-hydrated virus specimens. *J Electron Microsc Tech,* **8:**343-348. PMID3199217.

Robinson, J., Schmid, M.F., Morgan, D. and Chiu, W. (1988). Three-dimensional structural analysis of tetanus toxin by electron crystallography. *J Mol Biol,* **200:**367-375. PMID3373534.

Schrag, J.D., Schmid, M.F., Morgan, D.G., Phillips Jr., G.N., Chiu, W., and Tang, L. (1988). Crystallization and preliminary X-ray diffraction analysis of 11S acetylcholinesterase. *J Biol Chem,* **263:**9795-9800. PMID3384821.

Chang, C.-F., Rankert, D.A., Jeng, T.W., Morgan, D., Schmid, M.F., and Chiu, W. (1988). Cryoelectron microscopy of unstained, unfixed RecA-css DNA complexes. *J Ultrastruc Mol Struct Res,* **100:**166-172. PMID3066826.

Frank, J., Chiu, W., and Degn, L. (1988). The characterization of structural variations within a crystal field. *Ultramicroscopy,* **26:**345-360. PMID3238812.

Jeng, T.W., Crowther, R.A., Stubbs, G., and Chiu, W. (1989). Visualization of alpha helices in TMV by cryo-electron microscopy. *J Mol Biol,* **205:**251-257. PMID2926805.

Schrag, J., Prasad, B.V.V., Rixon, J.F., and Chiu, W. (1989). Three-Dimensional structure of the HSV-1 nucleocapsid. *Cell,* **56:**651-660. PMID2537151.

Chiu, W. (1989). Three–dimensional electron microscopy resource center. *EMSA Bull,* **19:**96-97.

Prasad, B.V.V., Burns, J.W., Marietta, E., Estes, M.K., and Chiu, W. (1990). Localization of VP4 neutralization sites in rotavirus by three-dimensional cryo-electron microscopy. *Nature,* **343:**476-479. PMID2153941.

Prasad, B.V.V., Degn, L.L., Jeng, T.-W., and Chiu, W. (1990). Estimation of allowable errors for tilt parameter determination in protein electron crystallography. *Ultramicroscopy,* **33:**281-285. PMID2260229.

Downing, K.H. and Chiu. W. (1990). Cold-stage design for high-resolution electron microscopy of biological materials. *Electron Microsc Rev,* **3:**213-226. PMID2103342.

Grant, R., Schmid, M.F., and Chiu, W. (1991). Analysis of symmetry and three-dimensional reconstruction of thin Gp32*I crystals. *J Mol Biol,* **217:**551-562. PMID1847218.

Brink, J. and Chiu, W. (1991). Contrast analysis of cryo-images of n-paraffin recorded at 400 kV out to 2.1 Å resolution. *J Microscopy,* **161:**279-295. PMID2038034.

Hewlett, M.J. and Chiu, W. (1991). Virion Structure. *Curr Top Microbiol Immunol,* **169:**79-90.

Wang, G.-J., Hewlett, M., and Chiu, W. (1991). Structural variation of La Crosse virions under different chemical and physical conditions. *Virology,* **184:**455-459. PMID1871980.

Schmid, M.F., Matsudaira, P., Jeng, T.-W., Jakana, J., Towns-Andrews, Bordas, J., and Chiu, W. (1991). Crystallographic analysis of acrosomal bundle from *Limulus* sperm. *J Mol Biol,* **221:**711-725. PMID1920441.

Rez, P., Chiu, W., Weiss, J., and Brink, J. (1992). The thickness determination of organic crystals under low-dose conditions using electron energy loss spectroscopy. *Microsc Res Tech,* **21:**166-170. PMID1558985.

Schmid, M.F., Jakana, J., Matsudaira, P., and Chiu, W. (1992). Effects of radiation damage with 400-kV electrons on frozen, hydrated actin bundles. *J Struct Biol,* **108:**62-68. PMID1562434.

Morgan, D.G., Grant, R.A., Chiu, W., and Frank, J. (1992). Patch averaging of electron images of gp32*I crystals with variable thickness. *J Struct Biol,* **108:**245-256. PMID1335748.

Brink, J., Chiu, W. and Dougherty, M. (1992). Computer-controlled spot-scan imaging of crotoxin complex crystals with 400-keV electrons at near atomic resolution. *Ultramicroscopy,* **46:**229-240. PMID1481273.

Chiu, W. (1993). What does electron cryomicroscopy provide that X-ray crystallography and NMR spectroscopy cannot? *Annu Rev Biophys Biomol Struct,* **22:**233-255. PMID8347990.

Schmid, M.F., Jakana, J., Matsudaira, P., and Chiu, W. (1993). Imaging frozen, hydrated acrosomal bundle from *Limulus* sperm at 7 Å Resolution with a 400-kV electron cryomicroscope. *J Mol Biol,* **230:**384-386. PMID8464053.

Zhou, Z.H. and Chiu, W. (1993). Prospects for using an IVEM with an FEG for imaging macromolecules towards atomic resolution. *Ultramicroscopy,* **49:**407-416. PMID8475604.

Avila-Sakar, A.J., Schmid, M.F., Li, L.-S., Whitby, F.G., Phillips Jr., G.N., and Chiu, W. (1993). Preliminary electron crystallographic analysis of ice-embedded tropomyosin crystals. *J Struct Biol,* **110:**67-74. PMID8494673.

Frank, J., Chiu, W., and Henderson, R. (1993). Flopping polypeptide chains and Suleika's subtle imperfections: Analysis of variations in the electron micrograph of a purple membrane crystal. *Ultramicroscopy* **49:**387-396. PMID8475603.

Prasad, B.V.V., Prevelige, P.E., Marietta, E., Chen, R.O., Thomas, D., King, J., and Chiu, W. (1993). Three-dimensional transformation of capsids associated with genome packaging in a bacterial virus. *J Mol Biol,* **231:**65-74. PMID8496966.

Chiu, W., Schmid, M.F., and Prasad, B.V.V. (1993). Teaching electron diffraction and imaging of macromolecules. *Biophys J,* **64:**1610-1625. PMC1262489.

Chiu, W. and Schmid, M.F. (1993). Electron crystallography of macromolecules. *Curr Opin Biotechnol,* **4:**397-402. PMID7763969.

Paredes, A.M., Brown, D.T., Rothnagel, R., Chiu, W., Schoepp, R.J., Johnston, R.E., and Prasad, B.V.V. (1993). Three-dimensional structure of a membrane-containing virus. *Proc Natl Acad Sci USA,* **90:**9095-9099. PMC47508.

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Soejima, T., Sherman, M.B., Schmid, M.F., and Chiu, W. (1993). 4-Å projection map of bacteriophage T4 DNA helix-destabilizing protein (gp32*I) crystal by 400-kV electron cryomicroscopy. *J Struct Biol,* **111:**9-16. PMID8251266.

Leapman, R., Brink, J. and Chiu, W. (1993). Low-dose thickness measurement of glucose-embedded crotoxin complex crystals by electron energy loss spectroscopy and STEM dark-field imaging. *Ultramicroscopy,* **52:**157-166. PMID8291165.

Schmid, M.F., Agris, J. M., Jakana, J., Matsudaira, P., and Chiu, W. (1994). Three-dimensional structure of a single filament in the *Limulus* acrosomal bundle: Scruin binds to homologous helix-loop-beta motifs in actin. *J Cell Biol,* **124:**341-350. PMC2119938.

Schmid, M.F., Prasad, B.V.V. and Chiu, W. (1994). Structural studies of viruses by electron cryomicroscopy. *Arch Virol Suppl,* **9:**523-529. PMID8032281.

Chiu, W. and Smith, T.J. (1994). Structural studies of virus-antibody complexes by electron cryomicroscopy and x-ray crystallography. *Curr Opin Struct Biol,* **4:**219-224. PMID8546007.

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Avila-Sakar, A.J., Guan, T.-L., Arad, T., Schmid, M.F., Loke, T.W., Yonath, A., Piefke, J., Franceschi, F. and Chiu, W. (1994). Electron Cryomicroscopy of *B. stearothermophilus* 50S ribosomal subunits crystallized on phospholipid monolayers. *J Mol Biol,* **239:**689-697. PMID8014989.

Sines, J., Rothnagel, R., van Heel, M., Gaubatz, J. W., Morrisett, J.D., and Chiu, W. (1994). Electron cryomicroscopy and digital image processing of lipoprotein(a). *Chem Phys Lipids,* **67/68:**81-89. PMID8187247.

Brink, J. and Chiu, W. (1994). Applications of a slow-scan CCD camera in protein electron crystallography. *J Struct Biol,* **113:**23-34. PMID7880650.

Zhou, Z.H., Prasad, B.V.V., Jakana, J., Rixon, F., and Chiu, W. (1994). Protein subunit structures in the herpes simplex virus capsid from 400 kV spot-scan electron cryomicroscopy. *J Mol Biol,* **242:**456-469. PMID7932703.

Serysheva, I.I., Orlova, E.V., Chiu, W., Sherman, M.B., Hamilton, S.L., and van Heel, M. (1995). Electron cryomicroscopy and angular reconstitution used to visualize the skeletal muscle calcium release channel. *Nat Struct Biol,* **2:1**8-24. PMID7719847.

Lu, G., Zhou, Z.H., Jakana, J., Cai, D., Chen, S., Wei, X., Gu, X., and Chiu, W. (1995). Three-dimensional structure of rice dwarf virus by electron cryomicroscopy. *High Tech Lett,* **1:**1-4.

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