Elizabeth Villa, Ph.D.

CONTACT INFORMATION

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RESEARCH INTERESTS

My lab develops tools to observe macromolecular complexes in their natural environment, the cell. Our ultimate goal is to unveil the structural dynamics of these complexes while they perform their function within the molecular networks in which they operate. We combine cell biology and electron microscopy to generate data, and we use image processing and physical modeling to understand these data. We apply our technologies to study biological processes in three areas: (1) unveiling the mechanism of cellular processes in bacteria, with a focus on how infection by jumbo phage results in formation of a nucleus-like compartments and a cytoskeleton, not seen before in prokaryotes; (2) the structure and function of LRRK2 in Parkinsons Disease, and (3) the molecular architecture of the nuclear periphery, including the structural dynamics of the nuclear pore and LINC complexes.

ACADEMIC POSITIONS

Howard Hughes Medical Institute

2021–Present	Investigator

University of California San Diego

2023–Present	Professor of Molecular Biology
2021–2023	Associate Professor of Molecular Biology
2017–2021	Assistant Professor of Molecular Biology
2014–2017	Assistant Professor of Chemistry and Biochemistry

Max Planck Institute for Biochemistry, Martinsried, Germany

2008–2014	Marie Curie Postdoctoral Fellow

University of Illinois at Urbana-Champaign, Urbana, IL

2008	Postdoctoral Fellow

EDUCATION

2008	**University of Illinois at Urbana-Champaign**, Urbana, IL USA Ph.D., Biophysics and Computational Biology Advisor: Klaus Schulten Thesis: Multiscale Simulations of Biomolecular Complexes.
2007	**Marine Biology Lab**, Woods Hole, Massachussetts, USA Summer Course in Physiology
2001	**Universidad de las Americas-Puebla**, Mexico B.S., Physics

HONORS AND AWARDS

2024	Pew Innovator Fund Investigator
2022	Keith Porter Fellow, ASCB
2017	Pew Scholar
2016	NIH New Innovator Award
2009 – 2011	European Commission Marie Curie Postdoctoral Fellowship
2008	Lebus Graduate Fellowship Award, UIUC
2001 – 2004	Fulbright Fellowship, Department of State, USA
2001	Graduated with Honours in Physics, U. de las Americas, Mexico
2000 – 2001	School of Sciences Dean's List, U. de las Americas, Mexico
1998 – 2001	Jenkins Excellence Scholarship, U. de las Americas, Mexico

Advisory Boards and Councils

2025–Present	Member, NIH Director Advisory Council
2024	Ad'Hoc Member, NIH Director Advisory Council
2023–Present	Member, Advisory Committee, Pew Latin American Fellows Program
2023–Present	Member, Scientific Advisory Board, Keystone Symposia
2022–Present	Member, Scientific Advisory Board, Cell Journal
2022	Ad'hoc Member, Scientific Advisory Board, Keystone Symposia
2020	Ad'hoc member, ThermoFisher Scientific Life Sciences Advisory Board
2019–2023	Member, NIH Center for Scientific Review Council
2016–2022	Member, Scientific Advisory Board, Max Planck Institute of Biophysics

Conference Organization

2025	Program Chair, Imaging Biomolecules across Scales, Keystone Symposium
2024	Program Co-Chair, Biophysical Society Meeting
2023	Organizer, Predicting the Future of Structural Biology Workshop, American Society for Cell Biology Annual Meeting
2020	Chair, Cryo-EM Subgroup, Biophysical Society Meeting
2018	Co-Chair, First Cryo-Electron Microscopy Keystone Symposium
2016	Co-Chair, First Annual Southern California Cryo-EM Symposium

Editorial Service

2025–Present	Member, Board of Reviewing Editors, Science Journal
2025	Ad'hoc Member, Editorial Board, Annual Reviews of Biophysics
2022–Present	Member, Advisory Board, Cell Journal
2024	PNAS, Ad'hoc Editor
2019	PNAS, Ad'hoc Editor
2017	Journal of Phys. Chem., Guest co-Editor, Klaus Schulten Memorial Issue

Grant Reviewer Service

2024	NSF Molecular Biophysics Cluster
2023	Schmidt Science Fellows, Schmidt Futures
2023	Consolidator Award, European Research Council
2022	Schmidt Science Fellows, Schmidt Futures
2021	Arnold and Mabel Beckman Foundation FIB-Milling Sample Preparation for Cellular Cryo-Electron Tomography RFA
2021	Schmidt Science Fellows, Schmidt Futures
2018	NIH NINDS SEP RFA-18-015 Structural Biology of Alzheimer's Disease Related Dementias (ADRDs) Proteinopathies, Ad'hoc Member
2017	NIH NIGMS Biochemistry and Biophysics of Membranes Study Section Ad'hoc Member
2016	Human Frontier Science Program, Reviewer
2016	Israel Science Foundation, Reviewer
2016	NSF Division of Molecular and Cellular Biosciences (MCB) Mail-in reviewer
2015	European Research Council Consolidator Grant Molecular and Structural Biology and Biochemistry Field, Reviewer

Keynotes and Named Lectures

2024	Fedric S. Fay Lecture, University of Massachusetts
2024	Keynote, Harvard Biophysics Program Annual Retreat
2024	Keynote, Rising Star Symposium, University of Utah
2024	Beadum and Tatum Lecture, Stanford University
2023	Keynote, Life Sciences Research Foundation Annual Meeting
2023	McClintock Lecture, Cold Sping Harbor Laboratory
2022	Bloch Lecture, Department of Molecular and Cellular Biology, Harvard
2022	Keynote, Austria Cryo-EM Symposium, Vienna, Austria
2022	Keynote, NIH Common Fund Meeting on Cryo-EM and Cryo-ET, NY
2022	Keynote, U. Michigan Chemistry-Biology Interface Program Symposium
2021	Keynote, New England Cryo-EM Meeting
2021	Joint Keynote, NAS Quantum Biology Workshop
2017	Keynote, Workshop on Advanced Topics in EM Structure Determination: Challenges and Opportunities, NYSBC, New York, NY

Selected Invited Talks and Seminars (2021–present)

2025	Talk, CryoEM: The Next 50 years, UC Berkeley
2024	Seminar, UC Davis
2024	Seminar, Instituto de Biotecnología, UNAM
2024	Talk, 3D-EM Gordon Research Conference
2024	Talk, Epigenome Symposium, John Hopkins University
2024	Talk, Cell Biology at the Nanoscale, UC Berkeley
2023	Rockefeller University Friday Lecture
2023	Seminar, Department of Plant and Microbial Biology, UC Berkeley
2023	Seminar, Department of Cell Biology, Yale University
2023	Talk, Molecular and Cell Biology Graduate Program Symposium, Frech Hutch
2023	BBC Seminar, UCSF
2023	Talk, Cryo-EM Subgroup, Biophysical Society Meeting
2023	Colloquium, Department of Biolgy, MIT
2022	Seminar, Voices in Science Seminar Series (student invited) , U Mass Chan
2022	Talk, Human Technopole Cryo-EM Inaugural Symposium, Milano, IT
2022	Talk, Symposium honoring Joachim Franks 80+ birthday
2022	Seminar, Department of Cell Biology, NYU Medical School
2022	Seminar, Novartis, San Diego CA
2022	Seminar, U. Penn Dept. of Physiology (student invited)
2021	Talk, EMBO workshop Seeing is Believing: Imaging the Molecular Processes of Life
2021	Seminar, Flatiron Institute, NYU
2021	Seminar, Dept of Biological Chemistry & Molecular Pharmacology, Harvard
2021	Colloquium, Department of Chemistry and Biological Chemistry, Harvard
2021	Seminar, Chemistry and Biochemistry (invited by students), UCLA

Active Funding

10.2021 – present	Investigator	HHMI	P.I.
11.2022 – 10.2025	Building a versatile toolbox for individualized bacteriophage therapeutics, Emergent Pathogens Initiative Consortium	HHMI	Lead P.I.
06.2022 – 05.2027	CHEETAH Center for the Structural Biology of HIV Infection, Restriction, and Viral Dynamics	NIAID	Co-P.I.
09.2018 – 06.2027	R01: Molecular and Cellular Biology of the Phage Nucleus and Spindle	NIGMS	Co-P.I.
10.2020 – 09.2025	Cellular Mechanism of LRRK2 in Health and Disease	ASAP	Co-P.I.
09.2024 – 08/2026	R21: In Situ Cryo-EM of Protein Condensates in the Early Secretory Pathway of Neurons	NIDA	Co-P.I.
12.2024 – 11/2027	Pew Innovation Fund Investigator	Pew	Co-P.I.

Diversity, Equity and Inclusion

2024 – Present	Faculty Research Mentor, FIRST Faculty Program, UCSD
2022	Search Committee Member, FIRST Faculty Program, UCSD
2022	Pre-Launch Advisor, HHMI Freeman Hrabowski Scholars Program
2023 – Present	Faculty Mentor, Keystone Fellow Program
2022	Guest, Science Like Me, UCTV Education Channel
2022	Guest, Mi Camino, UCTV Education Channel
2021	Featured in Mission Unstopabble! *A CBS show that highlights female innovators on the cutting edge of science designed for a female teen audience*
2021 – 2022	Member, DEI Committee, School of Biological Sciences, UCSD
2020	Speaker, Raza Centro UCSD and PIQE class for local Latinx parents *Course designed to bridge the gap of support that Latinx students need to prevail in their college careers.*
2020 – Present	Faculty Mentor, Biology Undergraduate and Masters Mentorship Program (BUMMP), UCSD
2020	Attendee, SACNAS virtual meeting

Diversity, Equity and Inclusion (continued)

2019	Keynote Speaker, Annual Women Faculty Reception, UCSD
2018	Speaker, SACNAS Pathways to Success Seminar, Northwestern University
2016 – 2020	Mentor, the Women Organization for Research Mentoring in STEM, UCSD and Biochemistry, UCSD
2016 - Present	Faculty mentor and host, ENLACE bi-national high-school and undergraduate summer research experience program, UCSD

Publications

Total citations: 29,226; Publications: 62; H-index: 44; I-index: 64; Publications with over 100 citations: 28 (Google Scholar, 1/2025).

Preprints

1. H. Zhou, J. Hutchings, M. Shiozaki, X. Zhao, L.K. Doolittle, S. Yang, R. Yan, N. Jean, M. Riggi, Z. Yu, E. Villa†, M.K. Rosen†. Quantitative Spatial Analysis of Chromatin Biomolecular Condensates using Cryo-Electron Tomography. **bioRxiv,** 2024.

2. L N. Young*, A. Sherrard*, H. Zhou, F. Shaikh, J. Hutchings, M. Riggi, M. K. Rosen, A. J. Giraldez†, E. Villa†. ExoSloNano: Multi-Modal Nanogold Tags for identification of Macromolecules in Live Cells and Cryo-Electron Tomograms. **bioRxiv**, 2024.

3. B. Raveh, R. Eliasian, S. Rashkovits, D. Russel, R. Hayama, S. E. Sparks, D. Singh, R. Lim, E. Villa, M. P. Rout, D. Cowburn, A. Sali. Integrative spatiotemporal map of nucleocytoplasmic transport. **bioRxiv,** 2024.

4. E.G. Armbruster, J. Lee, J. Hutchings, A.R. VanderWal, E. Enustun, B.A. Adler, A. Aindow, A. Deep, Z.K. Rodriguez, C.J. Morgan, M. Ghassemian, E. Charles, B.F. Cress, D.F. Savage, J.A. Doudna, K. Pogliano, K.D. Corbett, E. Villa†, J. Pogliano†. Sequential membrane- and protein-bound organelles compartmentalize genomres during phage infection. **bioRxiv,** 2023.

Peer-Reviewed

1. A. Prichard, A. Sy, J. Mayer, E. Villa, J. Pogliano. *Erwinia* phage Asesino is a nucleus-forming phage that lacks PhuZ. **Scientific Reports**, 2025.

2. S. Chen, T. Basiashvili, J. Hutchings, M. Sanz Murillo, A. Villagran Suarez, J. Alegrio Louro, A. E. Leschziner†, E. Villa†. Cryo-electron tomography reveals the microtubule-bound form of inactive LRRK2. **eLife**, 2024.

3. D. Singh*, N. Soni*, J. Hutchings*, I. Echeverria, F. Shaikh, M. Duquette, S. Suslov, Z. Li, T. van Eeuwen, K. Molloy, Y. Shi, J. Wang, Q. Guo, B.T. Chait, J. Fernandez-Martinez†, M.P. Rout†, A. Sali†, E. Villa†,. The Molecular Architecture of the Nuclear Basket. **Cell,** 2024.

4. J. Hutchings and E. Villa. Expanding insights from in situ cryo-EM. bf Current Opinion in Structural Biology, 2024.

5. E.A. Birkholz*, C.J. Morgan*, T.G. Laughlin, R.K. Lau, A. Prichard, S. Rangaraja, G.N. Meza, J. Lee, E.G. Armbruster, S. Suslov, K. Pogliano, J.R. Meyer, E. Villa†, K.D. Corbett†, J. Pogliano†. A mobile intron facilitates interference competition between co-infecting viruses. **Science**, 2024.

*Co-first author; †Co-corresponding author

PUBLICATIONS (CONTINUED)

6. C.J. Morgan, E. Enustun, E.G. Armbruster, E.A. Birkholz, A. Prichard, T. Forman, A. Aindow, W. Wannasrichan, S. Peters, K. Inlow, I.L. Shepherd, A. Razavilar, V. Chaikeeratisak, B.A. Adler, B.F. Cress, J.A. Doudna, K. Pogliano, E. Villa, K.D. Corbett, J. Pogliano. An essential and highly selective protein import pathway encoded by nucleus-forming phage. **PNAS,** 2024.

7. E. Enustun, A. Deep, Y. Gu, K. T. Nguyen, V. Chaikeeratisak, E. Armbruster, M. Ghassemian, E. Villa, J. Pogliano†, K. D. Corbett†. Identification of the bacteriophage nucleus protein interaction network. **Nature Structure Molecular Biology,** 2023.

8. L. N. Young, E. Villa. Bringing Structure to Cell Biology with Cryo-Electron Tomography. **Annual Reviews of Biophysics,** 2023.

9. A. Prichard, J. Lee, T.G. Laughlin, A. Lee, K.P. Thomas, A.E. Sy, T. Spencer, A. Asavavimol, A. Cafferata, M. Cameron, N. Chiu, D. Davydov, I. Desai, G. Diaz, M. Guereca, K. Hearst, L. Huang, E. Jacobs, A. Johnson, S. Kahn, R. Koch, A. Martinez, M. Norquist, T. Pau, G. Prasad, K. Saam, M. Sandhu, A.J. Sarabia, S. Schumaker, A. Sonin, A. Uyeno, A. Zhao, K.D. Corbett, K. Pogliano, J. Meyer, J.H. Grose, E. Villa, R. Dutton, J. Pogliano. Identifying the core genome of the nucleus-forming bacteriophage family and characterization of Erwinia phage RAY. **Cell Reports,** 2023.

10. K. Lasker*, S. Boeynaems*, V. Lam, E. Stainton, M. Jacquemyn, D. Daelemans, E. Villa, A.S. Holehouse, A. Gitler†, L. Shapiro†. The material properties of a bacterial-derived biomolecular condensate tune biological function in natural and synthetic systems. **Nature Communications**, 2022.

11. E.A. Birkholz, T.G. Laughlin, S. Suslov, E. Armbruster, J. Lee, J. Wittmann, K. D. Corbett, E. Villa†, J. Pogliano†. A Cytoskeletal Vortex Drives Phage Nucleus Rotation During Jumbo Phage Replication in *E. coli*. **Cell Reports**, 2022.

12. T. G. Laughlin*, A. Deep*, A. M. Prichard, C. Seitz, Y. Gu, E. Enustun, S. Suslov, K. Khanna, E. A. Birkholz, E. Armbruster, J. A. McCammon, R. E. Amaro, J. Pogliano†, K. D. Corbett†, E. Villa†. Architecture and self-assembly of the jumbo bacteriophage nuclear shell. **Nature**, 2022.

13. K. Khanna and E. Villa. Revealing bacterial cell biology using cryo-electron tomography **Curr. Opin. Struct. Biol.**, 2022.

14. V. Chaikeeratisak, K. Khanna, K.T. Nguyen, M.E. Egan, E. Enustun, E. Armbruster, K. Pogliano, E. Villa†, J. Pogliano†. Subcellular Organization of Viral Particles During Maturation of Nucleus-Forming Jumbo Phage. **Science Advances**, 2022.

15. C. W. Akey*†, D. Singh*, C. Ouch*, I. Echeverria*, I. Nudelman, J.M. Varberg, Z. Yu, F. Fang, Y. Shi, J. Wantg, D. Salzberg, K. Song, C.Xu, J.C. Gumbart, S. Suslov, J. Unruh, S.L. Jaspersen, B.T. Chait, A. Sali, J. Fernandez-Martinez†, S.J. Ludke†, E. Villa†, M.P. Rout†. Comprehensive Structure and Functional Adaptations of the Yeast Nuclear Pore Complex. **Cell**, 2022.

16. M. Croxford, M. Elbaum, M. Arigovindan, Z. Kam, D. A. Agard, E. Villa†, J. Sedat†. Entropy Regularized Deconvolution of Cellular Cryo-Transmission Electron Tomograms. **PNAS**, 2021.

17. K. Khanna, J. Lopez-Garrido, J. Sugie, K. Pogliano†, E. Villa†. Asymmetric localization of the cell division machinery during *Bacillus subtilis* sporulation. **eLife**, 2021.

*Co-first author; †Co-corresponding author

PUBLICATIONS (CONTINUED)

18. Lu*, Q. Ye*, D. Singh, E. Villa, D.W. Cleveland†, K. D. Corbett†. The SARS-CoV-2 Nucleocapsid phosphoprotein forms mutually exclusive condensates with RNA and the membrane-associated M protein. **Nature Communications**, 2021.

19. K.T. Nguyen, J. Sugie, K. Khanna, E.E. MacKennon, E.A. Birkholz, J. Lee, C. Beierschmitt, E. Villa, J. Pogliano. Selective transport of fluorescent proteins into the phage nucleus. **PLoS One**, 2021.

20. H. Yu, S. Lu, K. Gasior, D. Singh, O. Tapia, S. Vazquez-Sanchez, D. Toprani, M. S. Beccari, J. R. Yates III, S. Da Cruz, J. M. Newby, M. Larfaga, A. S. Gladfelter, E. Villa, D. W. Cleveland. TDP-43 and HSP70 phase separate into anisotropic, intranuclear liquid spherical annuli. **Science** , 2020.

21. V. Lam, E. Villa. Practical Approaches for Cryo-FIB Milling and Applications for Cellular Cryo-Electron Tomography. In: Gonen T., Nannenga B.L. (eds) **cryoEM. Methods in Molecular Biology**, vol 2215, 2021. Humana, New York, NY.

22. C. K. Deniston*, J. Salogiannis*, S. Mathea*, D. M. Snead, I. Lahiri, O. Donosa, R. Watanabe, J. Bhning, A. K Shiau, S. Knapp, E. Villa, S. L. Reck-Peterson†, A. E. Leschziner†. Parkinsons Disease-linked LRRK2 structure and model for microtubule interaction. *bioRxiv*, 2020. **Nature**, 2020.

23. R. Watanabe*, R. Buschauer*, J. Böhning*, M. Audagnotto, K. Lasker, T.W. Lu, D. Boassa, S. Taylor, E. Villa. The *in situ* structure of Parkinsons disease-linked LRRK2. **Cell**, 182, 1508-1518, 2020.

24. F. R. Wagner*, R. Watanabe*, R. Schampers, D. Singh, H. Persoon, M. Schaffer, P. Fruhstorfer, J. Plitzko, E. Villa. Preparing samples from whole cells using focused-ion-beam milling for cryo-electron tomography. **Nature Protocols**, 2020.

25. K. Thammatinna, M. E. Egan, H. H. Htoo, K. Khanna, J. Sugie, J.F. Nideffer, E. Villa, A. Tassanakajon, J. Pogliano, P. Nonejuie, V. Chaikeeratisak. A novel vibriophage exhibits inhibitory activity against host protein synthesis machinery. **Sci Rep** 10, 2347, 2020.

26. V. Chaikeeratisak, K. Khanna, K.T. Nguyen, J. Sugie, M. E. Egan, M. L. Erb, A. Vavilina, P. Nonejuie, E. Nieweglowska, A.F. Brilot, K. Pogliano, D. A. Agard, E. Villa†, J. Pogliano†. Viral Capsid Trafficking along Treadmilling Tubulin Filaments in Bacteria. **Cell**, 177, 110, 2019.

27. K. Khanna, J. Lopez-Garrido, Z. Zhao, R. Watanabe, Y. Yuan, K. Pogliano†, E. Villa†. The molecular architecture of engulfment during Bacillus subtilis sporulation. **eLife** 2019;8:e45257.

28. J. Lopez-Garrido, N. Ojkic, K. Khanna, F.R. Wagner, E. Villa, R.G. Endres, K. Pogliano. Chromosome Translocation Inflates Bacillus Forespores and Impacts Cellular Morphology. **Cell**, 172 (4), 758-770. e14, 2018.

29. V. Chaikeeratisak, K. T. Nguyen, K. Khanna, A. Brilot, M.L. Erb, J.K.C. Coker, A. Vavilina, R. Buschauer, K. Pogliano, E. Villa, D. Agard, J. Pogliano. Assembly of a nucleus-like structure during viral replication in Bacteria. **Science**, 355:194-197, 2017.

30. T.M. Earnest, R. Watanabe, J. E. Stone, J. Mahamid, W. Baumeister, E. Villa, and Z. Luther-Schulten. Challenges of Integrating Stochastic Dynamics and Cryo-Electron Tomograms in Whole-Cells Simulations. Klaus Schulten Memorial Issue, **J. Phys. Chem. B.**. 121:38713881, 2017.

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PUBLICATIONS (CONTINUED)

31. J. Mahamid, S. Pfeffer, M. Schaffer, E. Villa, R. Danev, L. Kuhn-Cuellar, F. Förster, A. A. Hyman, J. M. Plitzko and W. Baumeister. Visualizing the molecular sociology at the HeLa cell nuclear periphery. **Science**. 351:969-972, 2016.

32. B. Q. Spring, R. B. Sears, L.Z. Zheng, Z. Mai, R. Watanabe, M. E. Sherwood, D. A. Schoenfeld, B. W. Pogue, S. P. Pereira, E. Villa, and T. Hasan. A photoactivable multi-inhibitor nanoliposome for tumour control and simultaneous inhibition of treatment escape pathways. **Nature Nanotechnology**.11:378, 2016.

33. C. Plaschka, L. Lariviere, L. Wenzeck, M. Hemann, D. Tegunov, E.V. Petrotchenko, C.H. Borchers, W. Baumeister, F. Herzog, E. Villa, and P. Cramer. Architecture of the RNA polymerase II-Mediator core transcription initiation complex. **Nature**, 518, 2014.

34. B. D. Engel, M. Schaffer, L. K. Cuellar, E. Villa, J.M. Plitzko, W. Baumeister. Native architecture of the Chlamydomonas chloroplast revealed by in situ cryo-electron tomography **eLife**, 2014.

35. E. Villa, K. Lasker. Finding the right fit: chiseling structures out of cryo-electron microscopy maps. **Curr. Opin. Struct. Biol.**, 25:118–25, 2014.

36. E. Villa, M. Schaffer, J.M. Plitzko and W. Baumeister. Opening windows into the cell: focused-ion-beam milling for cryo-electron tomography. **Curr. Opin. in Struct. Biol.**, 23, 771–777, 2013.

37. M. Jasnin, S. Asano, E. Gouin, R. Hegerl, J.M. Plitzko, E. Villa, et al. Three-dimensional architecture of actin filaments in Listeria monocytogenes comet tails. **PNAS**, 110:20521-20526, 2013.

38. F. Beck, P. Unverdorben, S. Bohn, A. Schweitzer , G. Pfeifer, E. Sakata, S. Nickell, J.M. Plitzko, E. Villa, W. Baumeister, F. Förster. Near-atomic resolution structural model of the yeast 26S proteasome. **PNAS** 109:14870-14875, 2012.

39. J.P. Armache, A.M. Anger, V. Marquez, S. Frackenberg, E. Villa, M. Thomm., R. Beckmann, D.N. Wilson.Promiscuous behaviour of archaeal ribosomal proteins: Implications for eukaryotic ribosome evolution. **NAR** 41, 1284–1293, 2013.

40. A. Rigort, E. Villa, F. Bäuerlein, B.D. Engel, and J.M. Plitzko. Integrative Approaches for Cellular Cryo-electron Tomography: Correlative Imaging and Focused Ion Beam Micromachining. **Met. Cell. Biology**, 111, 259281,2012.

41. A. Rigort*, F.J.B. Bäuerlein*, E. Villa, M. Eibauer, T. Laugks, W. Baumeister and J.M. Plitzko. Focused ion beam micromachining of eukaryotic cells for cryo-electron tomography. **PNAS** 109, 4449-4454, 2012.

42. K. Lasker, F. Förster, S. Bohn, T. Walzthoenid, E. Villa, P. Unverdorben, F. Beck, R. Aebersold, A. Sali, and W. Baumeister. Molecular architecture of the 26S proteasome holocomplex determined by an integrative approach. **PNAS**, 109,1380-1387, 2012.

43. W. Qiu, N.D. Derr, B.S. Goodman, E. Villa, D. Wu, W. Shih and S.L. Reck-Peterson. Dynein achieves processive motion using both stochastic and coordinated stepping. **Nat Struct Mol Biol.** 19, 193-200, 2012.

44. A. Schönegge, E. Villa, F. Förster, R. Hegerl, J. Peters, W. Baumeister, and B. Rockel. The structure of human Tripeptidyl peptidase II as determined by a hybrid approach. **Structure** 20, 593-603, 2012.

*Co-first author; †Co-corresponding author

PUBLICATIONS (CONTINUED)

45. F. Förster, E. Villa, D. Thomas, A. Korinek, and W. Baumeister. Structure determination of macromolecular complexes by cryo-electron microscopy *in vitro* and *in situ*. Chapter in **Comprehensive Biophysics** 1, *Biophysical Techniques for Structural Characterization of Macromolecules*, ed. E. Egelman, and H.J. Dyson. Elsevier B. V. Academic Press, Oxford, pp. 245-276, 2012.

46. T. Becker, J.P. Armache, A.M.Anger, E. Villa, H. Sieber, B.A. Motaal, T. Mielke, O. Berninghausen, and R. Beckmann. Structure of the no-go mRNA decay complex Dom34-Hbs1 bound to a stalled 80S ribosome. **Nat Struct Mol Biol.** 18, 715-20, 2011.

47. L.G. Trabuco, E. Schreiner, J. Gumbart, J. Hsin, E. Villa, and K. Schulten. Applications of the molecular dynamics flexible fitting method. **Journal of Structural Biology**, 173, 420-427, 2011.

48. J.P. Armache*, A. Jarasch*, A.M. Anger*, E. Villa, T. Becker, S. Bhushan, F. Jossinet, M. Habeck, G. Dindar, S. Franckenberg, V. Marquez, T. Mielke, M. Thomm, O. Berninghausen, B. Beatrix, J. S?ding, E. Westhof, D.N. Wilson, and R. Beckmann. Localization of eukaryote-specific ribosomal proteins in a 5.5-Å cryo-EM map of the 80S eukaryotic ribosome. **PNAS**, 107: 19754-19759, 2010.

49. J.P. Armache*, A. Jarasch*, A.M. Anger*, E. Villa, T. Becker, S. Bhushan, F. Jossinet, M. Habeck, G. Dindar, S. Franckenberg, V. Marquez, T. Mielke, M. Thomm, O. Berninghausen, B. Beatrix, J. S?ding, E. Westhof, D.N. Wilson, and R. Beckmann. Cryo-EM structure and rRNA model of a translating eukaryotic 80S ribosome at 5.5-Å resolution. **PNAS**, 107: 19748-19753, 2010.

50. K. Ben-Harush, T. Maimon, I. Patla, E. Villa, and O. Medalia. Visualizing cellular processes at the molecular level by cryo-electron tomography. **J. Cell Science**, 123:7–12, 2010.

51. Förster F, E. Villa. Integration of cryo-EM with atomic and protein-protein interaction data. **Meth. Enzymol.**, 483:47-72 ,2010.

52. J.Gumbart, L.G.Trabuco, E.Schreiner, E. Villa, and K. Schulten. Regulation of the protein–conducting channel by a bound ribosome. **Structure**, 17:1453?1464, 2009.

53. E. Villa*, J. Sengupta*, L. Trabuco, J. LeBarron, W.T. Baxter, T. Shaikh, R.A. Grassucci, M. Ehrenberg, K. Schulten, and J. Frank. Ribosome-induced changes in elongation factor Tu conformation control GTP hydrolysis. **PNAS** 106:1063?1068, 2009.

54. J. Hsin, J. Gumbart, L.G. Trabuco, E. Villa, P. Qian, C.N. Hunter, and K. Schulten. Protein–induced membrane curvature investigated through molecular dynamics flexible fitting. **Biophysical Journal**, 97:321–329, 2009.

55. B. Seidelt, C.A. Innis, D.N. Wilson, M. Gartmann, J.P. Armache, E. Villa, L.G. Trabuco, T. Becker, T. Mielke, K.'Schulten, T.A. Steitz, and R. Beckmann. Structural insight into nascent polypeptide chain-mediated translational stalling. **Science**, 326:1412?1415, 2009.

56. L.G. Trabuco*, E. Villa*, E. Schreiner, C. B. Harrison, and K. Schulten. Molecular dynam- ics flexible fitting: A practical guide to combine cryo-electron microscopy and x-ray crystallography. **Methods**, 49:174–180, 2009.

57. M.K. Sener, J. Hsin, L.G. Trabuco, E. Villa, P. Qian, P.A. Bullough, C.N. Hunter, and K. Schulten. Structural model and excitonic properties of the dimeric LH1-RC-PufX complex from *Rhodobacter sphaeroides*. **Chemical Physics**, 357:188-197, 2009.

*Co-first author; †Co-corresponding author

PUBLICATIONS (CONTINUED)

58. L. G. Trabuco*, E. Villa*, K. Mitra, J. Frank, and K. Schulten. Flexible Fitting of Atomic Structures into Electron Microscopy Maps Using Molecular Dynamics. **Structure**, 16:673-683, 2008.

59. M. Gao, M. Sotomayor, E. Villa, E. Lee, and K. Schulten. Molecular mechanisms of cellular mechanics. **Phys. Chem. Chem. Phys.**, 8:3692?3706, 2006.

60. J. C. Phillips, R. Braun, W. Wang, J. Gumbart, E. Tajkhorshid, E. Villa, C. Chipot, R. D. Skeel, L. Kale, and K. Schulten. Scalable molecular dynamics with NAMD. J. Comp. Chem., 26:1781–1802, 2005.

61. E. Villa, A. Balaeff, and K. Schulten. Structural dynamics of the *Lac* repressor-DNA complex revealed by a multiscale simulation. **PNAS**, 102:6783-6788, 2005.

62. E. Villa, A. Balaeff, L. Mahadevan, and K. Schulten. Multi-scale method for simulating protein-DNA complexes. **Multiscale Modeling and Simulation**, 2:527-553, 2004.

*Co-first author; †Co-corresponding author