

Curriculum Vitae: **Michael S. Chapman**

Department of Biochemistry and Molecular Biology
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CURRENT POSITION

Professor of Biochemistry & Molecular Biology, Oregon Health & Science University
Interim Chair, Dept. Biochemistry & Molecular Biology (2014 -).
Richard T. Jones chair in Structural Biology (2006 –).

EDUCATION

| | | | |
|-------------------|--|--|---------|
| Post- doctoral | Structural virology Research: <i>Canine parvovirus, human rhinoviruses – antigenic sites and binding of anti-viral drugs;</i> | Purdue University, W. Lafayette, IN Advisor: Michael G. Rossmann | 1988-93 |
| Ph.D. | Biochemistry Thesis: <i>The Atomic Structure of Ribulose-1,5-bisphosphate Carboxylase Oxygenase (RuBisCO) from Tobacco;</i> | University of California, Los Angeles Advisor: David S. Eisenberg | 1983-7 |
| M.Sc. | Crystallography | University of London, Birkbeck College | 1982-3 |
| B.Sc.(Hons) | Cell/Molecular Biol. | Univ. of London, Kings College | 1979-82 |
| A.K.C. | Divinity | University of London, Kings College | 1979-82 |

PAST EMPLOYMENT

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|--------------------------------|--|-------------|
| Professor | Department of Chemistry & Biochemistry, Florida State University (FSU) | 2003-06 |
| Director | Center of Excellence in Biomolecular Computer Modeling & Simulation, FSU | 2000-06 |
| Courtesy faculty appointments: | Department of Biomedical Science (College of Medicine); Departments of Biological Science and of Physics (College of Arts & Sciences), FSU | 1997 - 2006 |
| Associate Professor | Department of Chemistry & Biochemistry, FSU | 1998-03 |

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| Associate Director | Institute of Molecular Biophysics, FSU | 1998-01 |
| Assistant Professor | Department of Chemistry, FSU | 1993-8 |
| Post-doctoral Assoc. | Department of Biological Science, Purdue University | 1988-93 |
| Teaching Associate | Program in Computing, UCLA | 1984-5 |
| Teaching Assist/Fell. | Department of Chemistry & Biochemistry, UCLA | 1983-5 |
| Research Assistant | National Institute of Research into Dairying (UK) | 1979 |

HONORS & AWARDS

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|--|---------|
| Fellow, American Association for the Advancement of Science | 2005- |
| President's Developing Scholar Award, Florida State University | 2000 |
| Council on Research & Creativity, First Year Assistant Professor Award | 1994 |
| Science & Engineering Research Council Studentship (UK) | 1982-3 |
| British Petroleum Education Trust Scholarship | 1979-82 |

ADMINISTRATION

Oregon Health & Science University:

Interim Chair, Dept. Biochemistry & Molecular Biology (2014 -)

Director, Quantitative Biosciences & Biomedical Engineering training pgm. (2013 -)

Florida State University:

Director, Ctr. Excellence: Biomolecular Computer Modeling & Simulation (2000 - 2006)

Co-director, Program in Computational Biology, School of Computational Science & Information Technology (1999 - 2002)

Associate Director, Institute of Molecular Biophysics (1998 – 2001)

UNIVERSITY SERVICE

Oregon Health & Science University Committees:

IDEAS Curriculum Committee (Sch. Medicine new grad. Curriculum); co-chair (2017 -)

Program in Molecular & Cellular Biosciences: Graduate Curriculum Committee (2017 -)

Dept. Molecular Microbiology & Immunology; Internal Review Committee (2015).

Center for Spatial Systems Biomedicine; Internal/External Review Committee (2014).

School of Medicine, Collaborative Research Leadership Group & Blueprint taskforce 1 (Research Investment), member (2011 -).

Quantitative Biosciences Graduate Program Steering Committee (2012 -).

School of Medicine, Conjoint Graduate Curriculum Committee, Chair (2012 -).

Program in Molecular & Cellular Biosciences: - Grad. Admissions Committee (2007-14)

Faculty search committee, Ctr. Systems & Spatial Biomedicine, Chair (2012-13).

Faculty search committee, Dept. Molecular & Medical Genetics (2010-11).

Electron Microscopy (EM) Core Facility Steering Committee (2012-).

Oregon Health & Science Department of Biochemistry & Molecular Biology:

Promotions & Tenure Committee (2007-14), Chair (2010-14).

Faculty search committee, Chair (2012-3).

Florida State University Committees:

School of Computational Science and Information Technology:

Executive committee (1995 – 2001)

Curriculum committee (1995 – 2003)

Chair, Faculty search committees (4) (2000 – 2004)

Provost's Faculty Travel Grant Committee (1998 - 2001).

College Teaching Fellowship / Dissertation Fellowship Committee (1999 - 2000).

Florida State University Departmental Service

Advisor, Biochemistry Major (1998 – 9).

Committee Chair – Endowed Chair search in Biocomputational Chem. (1999 – '03).
– Faculty search (1998-9).

Committee Member – Faculty search (1995-6, 2004-5).
– Faculty addition (1997 – 2006); Faculty merit evaluation (1997).
– Computing (1994-7); Seminar (1993-5; 1996-7; 2003)
– Capital Recourses & Space (1994-9; 2003-2005).
– Undergraduate curriculum & advising (1998-9).

Florida State University – Inst. Molecular Biophysics & Structural Biology Program

Committee Chair – Director search (2) (1997 & 2004-5).
– Faculty search (2 recruitments, 2001 - 2004)
– Curriculum (1996 – 2000); Symposium (1999 – 2001)

Committee Member – Executive (1994-6, 1997-2001, 2003-2006)
– Faculty search (8 recruitments, 1993 – 2005)
– Building (1993-7); Seminar (1993-5); Biosafety (1996 – 2001)

 PROFESSIONAL ACTIVITIES

Conference organization:

Conference Vice Chair, Chair (2000, 2002) Gordon Research Conference: Diffraction Methods in Structural Biology.

Symposium Chair (2001) 4th FSU Structural Biology Symposium: Computational Structural Biology – From Simulation to Experiment and Back

Session Chair: Am. Soc. Virology (1998); NorthWest Crystallography Workshop (2008)

Committees:

MBC – Molecular Biology Consortium - Runs beamline 4.2.2 at the Berkeley synchrotron for a consortium of universities – *Executive committee* (2006 -)

SERCAT - Southeast Regional Collaborative Access Team (\$16M development of synchrotron data collection facilities at the DOE Advanced Photon Source, Argonne Natl. Lab.)

Executive committee (1999 – 2006); *Operations Management* (1999 – 2002);

Funding (2000 – 2006); *Science* (2004 - 2006);

Delegate, Science Coalition: Meetings w/ Congressional delegation, Washington, 2000

Journal Referee

Acta Crystallographica;
 Biochemistry;
 Biochimica & Biophysica Acta;
 Comparative Biochem. & Physiol.

FEBS letters,
 HSFP Journal;
 Journal of Biological Chemistry,
 J. Crystal Growth;
 Journal of Virology,
 Nature;
 PLoS Biology;
 Protein Science,
 Science

Advances in Microbiology;
 Biophysical Journal;
 Colloids & Surfaces B: Interfaces;
 Computational & Structural Biotech. J.;
 Crit. Rev. Biochemistry & Molecular Biology;
 Future Virology;
 Insect Biochemistry & Molecular Biology,
 J. Chemical Theory & Computation;
 Journal of Molecular Biology,
 Journal of Structural Biology,
 Nature Structural Biology;
 Proceedings of the National Academy, USA;
 Proteins: Structure, Function & Genetics
 Structure

Grant Review Panels**National Institutes of Health:**

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| Chair, Special Emphasis Panel: Structural Genomics | 2001, 2006 |
| Chair, Special Panels (NCRR / NIGMS): | 2001, 2002, 2003, 2009, 2011, 2016 |
| Member, Macromolecular Structure & Function Panel C: | 2005 - 2008 |
| Member, Special Panels: | |
| NCRR / NIGMS National Centers: | 2000, 2001, 2004, 2014(x2) |
| Bioengineering (BST), 2 panels | 2007 |
| BST-M Challenge Grants panel 4 | 2009 |
| K99 | 2011 |
| R35 ZRG1 CB-N MIRA | 2017 |
| Temporary member: | |
| Virology A | 2004 |
| Macromolecular Structure & Function D: | 2010, 2014, 2015, 2016, 2017 |
| Macromolecular Structure & Function Panel B: | 2012 |
| Consultant, Neurological Sciences III & Experimental Virology panels | 1997 |

Ad Hoc Grant Review:

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| Medical Research Council, UK | 2010 |
| Biotechnology and Biological Sciences Research Council, UK | 2008, 2012-13 |
| Agence National de Recherches, France, | 2008 |
| DoD/EPSCoR (Dept. Defense / So. Carolina), | 2004 |
| National Science Foundation, | 2000 - 2003 |
| Wellcome Foundation / UK Government, | 2000 |
| Petroleum Research Fund, | 1996 |
| International Human Frontier Science Program, | 1994-5 |

Lecturer

International Union of Crystallography Macromolecular Computing School (1996)

NATO Adv. Study Inst. on Direct Methods for Solving Macromolecular Structures (1997)

GRANT SUPPORT

| Agency / ID | Title | Role | Dates | Annual direct costs |
|--|--|----------------|---------------|----------------------------------|
| Am Cancer Soc. F95-FSU-2 | Towards Anti-tumor Viruses I: Crystallization of Adenoassociated Virus | PI | 2/96 – 1/97 | \$22,000 |
| NSF BIR94-18741 | Application of Real-Space Refinement to Macro-molecular Structure Analysis | PI | 04/95-03/98 | \$75,128 |
| Am. Heart Assoc., FL 9701728 | Phosphagen Kinase Structure & Function: Immunoassay for the Diagnosis of Heart Attack | PI | 7/97 – 6/99 | \$45,454 |
| FSU Res. Fdn. | President's Developing Scholar Award | PI | 4/00 – 4/01 | \$10,000 |
| Natl. Science Foundation DBI-9808098 | Macromolecular structure: crystallographic structure determination / refinement using atomic electron density functions, and optimization of appropriate force fields for analysis | PI | 10/98 - 9/02 | \$89,995 |
| Am Cancer Soc. RPG-99-356-01-GMC | Towards an Anti-Cancer Virus: Structure & Function of Adenoassociated Virus | PI | 7/99 – 12/02 | \$100,000 |
| Natl. Inst. Health. R01-GM55837 | Phosphagen Kinase Structure, Mechanism and Specificity | PI | 3/98 – 2/04 | \$104,695 |
| FSURF Cornerstone | Center of Excellence: Biomolecular Computer Modeling & Simulation (<i>\$1M startup + acad. yr. salary to recruit 3 faculty.</i>) | PI | 12/00 – 11/02 | \$497,553 |
| National Institutes of Health P01 GM04676 | Membrane Protein Structural Genomics: <i>M. tuberculosis</i> . (Consortium PI = T.A. Cross) | Sub-project PI | 9/01 – 8/06 | \$1,245,352 (\$90,038 subcontr.) |
| National Institutes of Health R13 GM065888 | Conference: Diffraction Methods in Structural Biology (Gordon Conference) | PI | 5/02 – 4/03 | \$5,000 |
| National Institutes of Health R01 GM066875-01 | Structure-Function of AAV – a Viral Gene Therapy Vector | PI | 2/03 – 7/07 | \$175,770 |
| National Institutes of Health: GM077643-01 | Functional Dynamics during Induced-fit Enzyme Turnover. | PI | 2/07 – 1/12 | \$216,314 |

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|--|--|----------|--------------|-----------|
| National Institutes of Health: GM078538-01 | Refinement of Macromolecular Assembly Structure using Electron Microscopy | PI | 6/07 – 5/12 | \$186,803 |
| National Institutes of Health: GM066875-06 | Structure-Function of AAV - a Viral Gene Therapy Vector | PI | 8/07 – 7/12 | \$229,391 |
| Off. Naval Res. → Oregon Nano-science & Micro-technologies Inst. N000141010082 | Program in Nanoelectronics, Nanobiotechnology, and Nanometrology – task 2.2: DNA delivery targeted to the liver. | task PI | 1/10 – 12/10 | \$220,501 |
| Oregon Health & Science Univ. | Emerging Technology Fund: macromolecular X-ray Diffraction | PI | 7/11 – 6/12 | \$567,102 |
| National Institutes of Health: GM077643-05 | Functional Dynamics during Induced-fit Enzyme Turnover. | PI | 7/12 – 5/17 | \$299,860 |
| OR Ctr Spatial Sys Biomedicine OCSSB 614 | Visualizing specificity in the targeting of AAV gene therapy vectors. | PI | 7/13 – 6/14 | \$69,968 |
| National Institutes of Health: GM066875-13 | Structure-Function of AAV - a Viral Gene Therapy Vector | PI | 9/13 – 8/17 | \$273,090 |
| Oregon Engineering & Technology Industry Council | Quantitative Bioscience & Biomedical Engineering | Director | 7/14 – 6/16 | \$329,981 |
| Hearst Fdn. | Quantitative Bioscience & Biomedical Engineering Scholars Program | Director | 12/14 – 6/18 | \$250,000 |
| Oregon Empl. Dept./Oregon Talent Council 16-098-0002 | Industry-relevant Training and Research Experiences for Biomedical Engineering and Data Science Students | PI | 4/16 – 6/17 | \$537,992 |
| National Institutes of Health: R35 GM122564-01 | Adeno-Associated Virus Gene Therapy Vectors: Molecular Interactions on Cell Entry (MIRA) | PI | 8/17 – 7/22 | \$496,384 |

Pending Funding

| Agency / ID | Title | Role | Dates | Annual direct costs |
|---|--|------|-------------|--------------------------------|
| National Institutes of Health: U24 OD025238-01 (Gouaux) | Pacific Northwest Center for Cryo-EM (J.E. Gouaux, contact PI; J. E. Evans & M.S. Chapman, MPIs) | MPI | 4/18 – 3/24 | \$8,268,441 pending IRG review |

Supporting Roles in Grants

| Agency / ID (PI) | Title | Role | Dates | Annual direct costs |
|--|--|-----------------------------|------------------|----------------------------|
| Am. Heart Assoc. (S. Bhatia) | Pre-doctoral fellowship: The Atomic and Immunogenic Structure of Adenoassociated Virus - Improving a Gene Therapy Vector | Sponsor | 7/99 – 6/01 | \$16,000 |
| NSF 96-02233 (L. Makowski) | Structural Biology of Macromolecular Assemblies: A Research Training Group at Florida State University | 1 of 5 authors | 6/96 – 9/02 | \$270,021 |
| NSF / Natl. High Mag. Field Lab. IHRP 5024-641-22 project 5045 | Functional Dynamics of Arginine Kinase: Development of TROSY-based spectroscopy (PI = Jack Skalicky) | Co-I, assume PI role, 03/04 | 01/03 – 12/05 | \$49,700 |
| Am. Heart Assoc. 0315101B (J. Bush) | Pre-doctoral fellowship: Lombricine kinase structure & specificity | Sponsor | 7/03 – 6/05 | \$19,000 |
| Am. Heart Assoc. 0415212B (E.A. Ruben) | Pre-doctoral fellowship: A Computational Study of Arginine Kinase Catalysis | Sponsor | 7/04 – 6/07 | \$21,000 |
| Am. Heart Assoc. 0415115B (O. Davulcu) | Pre-doctoral fellowship: Functional Dynamics of Arginine Kinase | Sponsor | 7/04 – 6/06 | \$20,000 |
| Natl. Inst. Health S10 RR020919 (K.A. Taylor) | Purchase of a large format CCD camera for 3-D EM | Co-PI | 4/05 – 3/07 | \$281,300 |
| Am. Heart Assoc. 0515201B (J. O'Donnell) | Pre-doctoral fellowship: Mapping Adeno-associated virus-2 cellular receptor binding sites using Cryo-Electron Microscopy | Sponsor | 7/05 – 6/07 | \$21,000 |
| Am. Heart Assoc. 0515203B (H.M. Ongley) | Pre-doctoral fellowship: Structural Studies of Adeno-associated Virus Serotypes 3b and 6 | Sponsor | 7/05 – 6/07 | \$21,000 |
| Natl. Inst. Health S10 RR024561 (K.A. Taylor) | CryoEM Equipment Enhancements for Florida State University | Major user | 3/08 – 2/09 | \$177,959 |
| Natl. Inst. Health S10 RR025080 (K.A. Taylor) | Purchase of a FEI Titan Krios for 3-D EM | Major user | 7/08 – 6/10 | \$2,000,000 |

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| Off. Naval Res. → Oregon Nano- science & Micro- technologies Inst. (E. Minot) | Electronic detection of single molecule dynamics | co-PI | 1/09 – 12/09 | \$229,736; \$5,000 sub- project |
| Am. Heart Assoc., Pacific Mountain Affiliate 09PRE2020112 (J.C. Summerton) | Pre-doctoral fellowship: The role of stereoelectronics in kinase catalysis | Sponsor | 7/09 – 6/11 | \$25,000 |
| Am. Heart Assoc., Pacific Mountain Affiliate 10POST2600203 (T.F. Lerch) | Post-doctoral fellowship: The Structure and Function of Adeno-Associated Virus (AAV) – a Viral Gene Therapy Vector | Sponsor | 1/10 – 12/11 | \$48,428 |
| Vertex Inc. (J.C. Summerton) | Vertex Scholarship | Faculty mentor | 7/11 – 6/12 | \$25,000 |
| Natl. Inst. Health S10 OD018518 (E.J. Barbar, OSU) | Acquisition of a 700 MHz NMR Spectrometer | Major user | 2/15 – 2/17 | \$1,300,000 |
| M.J. Murdock Charitable Trust (E.J. Barbar, OSU) | Upgrade to an 800 MHz NMR Spectrometer | Major user | 2/15 – 2/17 | \$504,000 |

PUBLICATIONS

1. Chapman, M. S., Smith, W. W., Suh, S. W., Cascio, D., Howard, A., Hamlin, R., Xuong, N. H. & Eisenberg, D. (1986). Structural studies of RuBisCO from tobacco. ***Phil. Trans. Roy. Soc. Lond.*** B313, 367-378. PMID: 2878449.
2. Chapman, M., Suh, S. W., Cascio, D., Smith, W. W. & Eisenberg, D. (1987). Sliding-layer conformational change limited by quaternary structure in plant RuBisCO. ***Nature*** 329, 354-356. PMID: 3627277.
3. Eisenberg, D., Almassy, R. J., Janson, C. A., Chapman, M. S., Suh, S. W., Cascio, D. & Smith, W. W. (1987). Some Evolutionary Relationships of the Primary Biological Catalysts Glutamine Synthetase and RuBisCO. ***Cold Spr. Har. Symp. Quant. Biol.*** LII, 483-90. PMID: 2900091.
4. Eisenberg, D., Chapman, M. S., Suh, S. W., Cascio, D. & Smith, W. W. (1987). The Path of the Polypeptide Backbone of Ribulose-1,-5-*bis*-phosphate from *Nicotiana tabacum*. In *International Workshop on Ribulose-1,-5-bis-phosphate carboxylase-oxygenase* (Bohnert, H. J. & Jensen, R. G., eds.). University of Arizona Press, Tuscon, AZ.
5. Suh, S. W., Cascio, D., Chapman, M. S. & Eisenberg, D. S. (1987). A Crystal Form of Ribulose-1,-5-*bis*-phosphate Carboxylase--Oxygenase from *Nicotiana tabacum* in the Activated state. ***J. Mol. Biol.*** 197, 363-365. PMID: 3681999.
6. Chapman, M. S., Suh, S. W., Curmi, P. M. G., Cascio, D., Smith, W. W. & Eisenberg, D. S. (1988). Tertiary Structure of Plant RuBisCO: Domains and their Contacts. ***Science*** 241, 71-74. PMID: 3133767.
7. Hajdu, J., Clifton, I. J., Hadfield, A., Howell, P. L., Almo, S. C., Petsko, G. A., Greenhough, T. J., Shrive, A. K., Campbell, J. W., Parson, M., Harrison, S. C., Liddington, R. C., Rossmann, M. G. & Chapman, M. (1989). *Laue Crystallography of Macromolecules and Viruses*. In ***Daresbury Annal.*** (Warrington, UK, Daresbury Laboratory) pp. 42-46.
8. Kim, S., Smith, T. J., Chapman, M. S., Rossmann, M. G., Pevear, D. C., Dutko, F. J., Felock, P. J., Diana, G. D. & McKinlay, M. A. (1989). Crystal Structure of Human Rhinovirus Serotype 1A (HRV1A). ***J. Mol. Biol.*** 210, 91-111. PMID: 2555523.
9. Chapman, M. S., Giranda, V. L. & Rossmann, M. G. (1990). The Structures of Human Rhinovirus and Mengo Virus: Relevance to Function and Drug Design. ***Sem. Virol.*** 1, 413-27.
10. Giranda, V. L., Chapman, M. S. & Rossmann, M. G. (1990). Modelling of the Human Intercellular Adhesion Molecule-1, the Human Rhinovirus Major Group Receptor. ***Proteins*** 7, 227-33. PMID: 1972986.
11. Giranda, V. L., Chapman, M. S., Rossmann, M. G., Staunton, D. & Springer, T. A. (1990). Modelling of the C1 Intercellular Adhesion Molecule 1 (ICAM-1), the Human Rhinovirus Major Group Receptor. In *New Aspects of Positive Strand RNA Viruses*, M.A. Brinton, and F.X. Heinz, eds. (Washington, DC: ASM Press).
12. Chapman, M. S., Minor, I., Rossmann, M. G., Diana, G. D. & Andries, K. (1991). Human rhinovirus 14 complexed with antiviral compound R 61837. ***J. Mol. Biol.*** 217, 455-63. PMID: 1847215.
13. Tsao, J., Chapman, M. S., Agbandje, M., Keller, W., Smith, K., Wu, H., Luo, M., Smith, T. J., Rossmann, M. G., Compans, R. W. & Parrish, C. (1991). The Three-Dimensional Structure of Canine Parvovirus and its Functional Implications. ***Science*** 251, 1456-1464. PMID: 2006420.

14. Chapman, M. S., Tsao, J. & Rossmann, M. G. (1992). *Ab initio* Phase Determination for Spherical Viruses: Parameter Determination for Spherical Shell Models. **Acta Crystallogr.** A48, 301-312. PMID: 1605933.
15. Mallamo, J. P., Diana, G. D., Pevear, D. C., Dutko, F. J., Chapman, M. S., Kim, K. H., Minor, I., Oliveira, M. & Rossmann, M. G. (1992). Conformationally Restricted Analogues of Disoxaril: A comparison of the Activity against Human Rhinovirus Type 14 and 1A. **J. Med. Chem.** 35, 4690-4695. PMID: 1335081.
16. Tsao, J., Chapman, M. S. & Rossmann, M. G. (1992). *Ab initio* Phase Determination for Viruses with High Symmetry: A Feasibility Study. **Acta Crystallogr.** A48, 293-301. PMID: 1318726.
17. Tsao, J., Chapman, M. S., Wu, H., Agbandje, M., Keller, W. & Rossmann, M. G. (1992). Structure Determination of Monoclinic Canine Parvovirus. **Acta Crystallogr.** B48, 75-88. PMID: 1616694.
18. Chapman, M. S. (1993). Mapping the Surface Properties of Macromolecules. **Prot. Sci.** 2, 459-469. PMID: 8384042.
19. Chapman, M. S., Kim, K. H. & Rossmann, M. G. (1993). Structural Comparisons of Several Antiviral Agents Complexed with Human Rhinoviruses of Different Serotypes. **Antiviral News** 1, 53-53.
20. Chapman, M. S. & Rossmann, M. G. (1993). Structure, Sequence and Function Correlations among Parvoviruses. **Virology** 194, 491-508. PMID: 8503170.
21. Chapman, M. S. & Rossmann, M. G. (1993). Comparison of Surface Properties of Picornaviruses: Strategies for hiding the Receptor Site from Immune Surveillance. **Virology** 195, 745-765. PMID: 8337843.
22. Kim, K. H., Willingmann, P., Gong, Z. X., Kremer, M. J., Chapman, M. S., Minor, I., Oliviera, M. A., Rossmann, M. G., Andries, K., Diana, G. D., Dutko, F. J., McKinlay, M. A. & Pevear, D. C. (1993). A comparison of the anti-rhinoviral drug binding pocket in HRV14 and HRV1A. **J. Mol. Biol.** 230, 206-227. PMID: 8383771.
23. Chapman, M. S. (1994). Sequence Similarity Scores and the Inference of Structure/Function Relationships. **Computer Applications in the Biosciences (CABIOS)** 10, 111-119. PMID: 8019858.
24. Chapman, M. S. (1995). Restrained Real-Space Macromolecular Atomic Refinement using a New Resolution-Dependent Electron Density Function. **Acta Crystallogr.** A51, 69-80. doi:10.1107/S0108767394007130
25. Chapman, M. S. & Rossmann, M. G. (1995). Single-stranded DNA-protein interactions in Canine Parvovirus. **Structure** 3, 151-62. PMID: 7735832.
26. Hadfield, A., Hajdu, J., Chapman, M. S. & Rossmann, M. G. (1995). Laue Diffraction Studies of Human Rhinovirus 14 and Canine Parvovirus. **Acta Crystallogr.** D51, 859-70. PMID: 15299756.
27. Chapman, M. S. & Rossmann, M. G. (1996). Structural Refinement of the DNA-containing Capsid of Canine Parvovirus using **RSRef**, a Resolution-Dependent Stereochemically Restrained Real-Space Refinement Method. **Acta Crystallogr.** D52, 129-39. PMID: 15299734.
28. Chapman, M. S. (1996). Cross-validation R-factors and their use in comparing the qualities of refined models for the DNA-containing and empty capsids of canine parvovirus. **Acta Crystallogr.** D52, 140-2. PMID: 15299734.
29. Xie, Q. & Chapman, M. S. (1996). Canine parvovirus capsid structure, analyzed at 2.9 Å resolution. **J. Mol. Biol.** 264, 497-520. PMID: 8969301.
30. Zhou, G., Parthasarathy, G., Somasundaram, T., Ables, A., Roy, L., Strong, S. J., Ellington, W. R. & Chapman, M. S. (1997). Expression, Purification from Inclusion Bodies, and Crystal Characterization of Transition State Analog Complex of Arginine

- Kinase: a Model for Studying Phosphagen Kinases. *Prot. Sci.* **6**, 444-9. PMID: 9041648.
31. Blanc, E. & Chapman, M. S. (1997). *RSRef*: Interactive real-space refinement with stereochemical restraints for use during model-building. *J. Appl. Cryst.* **30**: 566-7. doi:10.1107/S002188989700592X
 32. Chapman, M. S. & Blanc, E. (1997). Potential use of Real Space Refinement in Protein Structure Determination. *Acta Crystallogr.* **D53**, 203-6. PMID: 15299957.
 33. Chapman, M. S. (1998). Watching "One's" Ps and Qs: Promiscuity, Plasticity and Quasi-Equivalence in a T=1 virus. *Biophys. J.* **74**: 639-44. PMID: 9449365.
 34. Chapman, M. S. (1998). Introduction to the use of non-crystallographic symmetry in phasing. In *Direct Methods for Solving Macromolecular Structures* (Fortier, S., ed.), pp. 99-108. Kluwer, Dordrecht, Netherlands.
 35. Chapman, M. S., Blanc, E., Johnson, J. E., McKenna, R., Munshi, S., Rossmann, M. G. & Tsao, J. (1998). Use of non-crystallographic symmetry for ab initio phasing of virus structures. In *Direct Methods for Solving Macromolecular Structures* (Fortier, S., ed.), pp. 433-442. Kluwer, Dordrecht, Netherlands.
 36. Blanc, E., Chen, Z. & Chapman, M. S. (1998). Real-Space Refinement Using *RSRef*. In *Direct Methods for Solving Macromolecular Structures* (Fortier, S., ed.), pp. 513-9. Kluwer, Dordrecht, Netherlands.
 37. Zhou, G., Wang, J., Blanc, E. & Chapman, M. S. (1998). Determination of the Relative Precision of Atoms in a Macromolecular Structure. *Acta Crystallographica D54*, 391-9. PMID: 9761907.
 38. Zhou, G., Somasundaram, T., Blanc, E., Parthasarathy, G., Ellington, W. R. & Chapman, M. S. (1998). Transition state structure of arginine kinase: Implications for catalysis of bimolecular reactions. *Proceedings of the National Academy of Sciences, USA* **95**, 8449-54. PMID: 9671698.
 39. Chen, Z., Blanc, E. & Chapman, M. S. (1998). Real Space Molecular Dynamics Refinement. *Acta Crystallographica D55*: 464-8. PMID: 10089356.
 40. Chen, Z., Blanc, E. & Chapman, M. S. (1999). Improved free R-factors for the cross-validation of structures. *Acta Crystallographica D55*: 219-224. PMID: 10089412.
 41. Zhou, G., Somasundaram, T., Blanc, E. & Chapman, M. S. (1999). Critical Initial Real Space Refinement in the Structure Determination of Arginine Kinase. *Acta Crystallographica D55*: 835-845. PMID: 10089314.
 42. Zhou, G., Ellington, W.R. & Chapman, M.S. (2000). Induced Fit in Arginine Kinase. *Biophys J* **78**: 1541-1550. PMID: 10692338.
 43. Bertram, R., J. R. Quine, M. S. Chapman and T. A. Cross (2000). "Atomic Refinement Using Orientational Restraints from Solid-State NMR." *J. Magnetic Resonance*, **147**: 9-16. PMID: 11042042.
 44. Blanc, E., G. Zhou, Z. Chen, Q. Xie, J. Tang, J. Wang, and M.S. Chapman. 2001. Electron Density Representation and Real Space Refinement (New tricks from an old dog). In: Watenpaugh, K.D., and P.E. Bourne, editors. *Crystallographic Computing 7: Proceedings of the IUCr Macromolecular Computing School, 1996*. Corby, UK: Oxford University Press..
 45. Gerstein, M., F. Richards, M.S. Chapman, and M. Connolly. 2001. Protein surfaces and volumes: measurement and use. In: Rossmann, M.G., and E. Arnold, editors. *International Tables for Crystallography. Crystallography of Biological Molecules*. Dordrecht, Netherlands: Kluwer Academic Publishers. p 531-45 (Cpt. 22.1).
 46. Chen, L.F., E. Blanc, M.S. Chapman, and K.A. Taylor. 2001. Real space refinement of acto-myosin structures from sectioned muscle. *J Struct Biol* **133**:221-32. PMID: 11472093.

47. Chen, Z., and M.S. Chapman. 2001. Conformational Disorder of Proteins Assessed by Real-Space Molecular Dynamics Refinement. *Biophys J* 80:1466-1472. PMID: 11222306.
48. Korostelev, A., Bertram, R., and Chapman, M.S. 2002. Simulated Annealing Real-Space Refinement as a Tool in Model Building. *Acta Crystallogr. D* 58: 761-767. PMID: 11976486.
49. Bubb, M.R., Govindasamy, L., Yarmola, E.G., Vorobiev, S.M., Almo, S.C., Somasundaram, T., Chapman, M.S., Agbandje-McKenna, M., and McKenna, R. 2002. Polylysine induces an antiparallel actin dimer that nucleates filament assembly: crystal structure at 3.5-Å resolution. *J Biol Chem* 277: 20999-21006. PMID: 11932258.
50. Fabiola, F., Bertram, R., Korostelev, A., and Chapman, M.S. 2002. An improved hydrogen bond potential: impact on medium resolution protein structures. *Protein Sci* 11: 1415-1423. PMID: 12021440; PMC2373622.
51. Xie, Q., Bu, W., Bhatia, S., Hare, J., Somasundaram, T., Azzi, A., and Chapman, M.S. 2002. The atomic structure of adeno-associated virus (AAV-2), a vector for human gene therapy. *Proc Natl Acad Sci U S A* 99: 10405-10410. PMID: 12136130.
52. Yousef, M.S., Fabiola, F., Gattis, J., Somasundaram, T., and Chapman, M.S. 2002. Refinement of Arginine Kinase Transition State Analogue Complex at 1.2 Å resolution; mechanistic insights. *Acta Crystallogr. D. Biol. Crystallogr.* 58: 2009-2017. PMID: 12454458.
53. Yousef, M.S., Clark, S., Pruetz, P.S., Somasundaram, T., Ellington, W.R., and Chapman, M.S. 2003. Induced Fit in Guanidino Kinases - Comparison of Substrate-free and Transition State Analog Structures of Arginine Kinase. *Protein Sci.* 12: 103-111. PMID: 12493833.
54. Xie, Q., T. Somasundaram, S. Bhatia, W. Bu, and M.S. Chapman, Structure determination of adeno-associated virus 2: three complete virus particles per asymmetric unit. *Acta Crystallogr D Biol Crystallogr*, 2003. 59: 959-70. PMID: 12777756.
55. Gao, H., J. Sengupta, M. Valle, A. Korostelev, N. Eswar, S.M. Stagg, P. VanRoey, R.K. Agrawal, S.C. Harvey, A. Sali, M. Chapman, and J. Frank, *Study of the Structural Dynamics of the E. coli 70S Ribosome Using Real Space Refinement. Cell*, 2003. 113: 789-801. PMID: 12809609.
56. Chapman, M.S., and Liljas, L. 2003. Structural Folds of Viral Proteins. In *Advances in Protein Chemistry*. (eds. W. Chiu, and J.E. Johnson), 64: 125-196. Academic Press. PMID: 13677047.
57. Pruetz, P.S., A. Azzi, S.A. Clark, M. Yousef, J.L. Gattis, T. Somasundaram, W.R. Ellington, and M.S. Chapman, *The putative catalytic bases have, at most, an accessory role in the mechanism of arginine kinase. J Biol Chem*, 2003. 29: 26952-7. PMID: 12732621.
58. Bertram, R., T. Asbury, F. Fabiola, J. R. Quine, T. A. Cross and M. S. Chapman (2003). "Atomic Refinement with Correlated Solid-State NMR Restraints." *Journal of Magnetic Resonance*, 2003. 163: 300-9. PMID: 12914845.
59. Chen, J.Z., Furst, J., Chapman, M.S., and Grigorieff, N. 2003. Low-resolution structure refinement in electron microscopy. *J Struct Biol* 144: 144-151. PMID: 14643217.
60. Azzi, A., Clark, S.A., Ellington, W.R., and Chapman, M.S. 2004. The Role of Phosphagen Specificity Loops in Arginine Kinase. *Protein Sci.* 13: 575-585. PMID: 14978299.

61. Gattis, J. L., E. Ruben, Fenley, M.O., Ellington, W.R., and Chapman, M.S (2004). "The active site cysteine of arginine kinase - structural and functional analysis of partially active mutants." **Biochemistry**, 43: 8680-8689. PMID: 15236576.
62. Xie, Q., Hare, J., Bu, W., Jackson, W., Turnigan, J., and Chapman, M. S. (2004) Large-scale Preparation, Purification and Crystallization of Wild-type Adeno-Associated Virus 2, **Journal of Virological Methods**, 122: 17-27. PMID: 15488616.
63. Korostelev, A., Fenley, M. O., and Chapman, M. S. (2004) Impact of a Poisson-Boltzmann Electrostatic Restraint on Protein Structures Refined at Medium Resolution, **Acta Crystallographica D, Biological Crystallography**, 60: 1786-1794. PMID: 15388925.
64. Quine, J.R., Cross, T.A., Chapman, M.S. and Bertram, R., 2004. Mathematical Aspects of protein structure determination with NMR orientational restraints. **Bull. Math. Biol.** 66: 1705-1730. PMID: 15522352.
65. Fabiola, F. and Chapman, M.S. (2005) Fitting of High Resolution Structures into Electron Microscopy Reconstruction Images, **Structure**, 13: 389-400. PMID: 15766540.
66. Davulcu, O., S. A. Clark, M. S. Chapman and J. J. Skalicky (2005). "Main chain 1H, 13C, and 15N resonance assignments of the 42 kDa enzyme arginine kinase." **Journal of Biological NMR**, 32: 178. PMID: 16034675.
67. Ruben, E. A., Evanseck, J. D., and Chapman, M. S. (2005) A theoretical study of N-phosphoryl-guanidinium tautomers - influences of hyperconjugation on N-P bond strength, **Journal of the American Chemical Society**, 127: 17789-17798. PMID: 16351108.
68. Chapman, M.S., and Agbandje-McKenna, M. 2006. Atomic structure of viral particles. In *Parvoviruses*. (eds. M.E. Bloom, S.F. Cotmore, R.M. Linden, C.R. Parrish, and J.R. Kerr), pp109-123. Edward Arnold, Ltd., London.
69. Agbandje-McKenna, M., and Chapman, M.S. 2006. Structure-function relationships. In *Parvoviruses*. (eds. M.E. Bloom, S.F. Cotmore, R.M. Linden, C.R. Parrish, and J.R. Kerr), pp125-139. Edward Arnold, Ltd., London.
70. Chapman, M. S. The Structural Enzymology of Arginine Kinase and its Implications for Creatine Kinase, in *Creatine kinase biochemistry, physiology, structure and function* (Vial, C., Ed.), NovaScience, New York, pp. 69-94 (2006).
71. Fabiola, F., Korostelev, A. & Chapman, M. S. Cross-validation with Over-sampled Structure Factors. **Acta Crystallogr D Biol Crystallogr**, 62: 227-38 (2006). PMID: 16510969.
72. Quine, J.R., Achuthan, S., Asbury, T., Bertram, R., Chapman, M.S., Hu, J. and Cross, T.A., 2006. Intensity and mosaic spread analysis from PISEMA tensors in solid state NMR. **Journal of Magnetic Resonance**, 179: 190-198. PMID: 16413215.
73. Murray, S., Nilsson, C. L., Hare, J. T., Emmett, M. R., Korostelev, A., Ongley, H., Marshall, A. G. & Chapman, M. S. Characterization of the Capsid Protein Glycosylation of Adeno-associated Virus (AAV-2) by High Resolution Mass Spectrometry. **Journal of Virology**, 80: 6171-6 (2006). PMID: 16731956.
74. Mitra, K., Schaffitzel, C., Fabiola, F., Chapman, M. S., Ban, N. & Frank, J. Elongation arrest by SecM via a cascade of ribosomal RNA rearrangements. **Molecular Cell**, 22: 533-43 (2006). PMID: 16713583.
75. Mitchell, D. A. J., O'Donnell, J., Hare, J. T. & Chapman, M. S. Serotype-Specific Detection During Laboratory Preparation of Adeno-Associated Virus. **Journal of Virological Methods**, 136: 277-82 (2006). PMID: 16815560.
76. Asbury, T., Bertram, R., Quine, J. R., Achuthan, S., Chapman, M. S. & Cross, T. A. PIPATH: and Algorithm for Assignment of PISEMA Data. **Journal of Magnetic Resonance**, 183: 87-95 (2006). PMID: 16914335.

77. Chapman, M.S. Normalizing Normal Mode Analysis; **Structure**, 15: 135-6 (2007). PMID: 17292830.
78. Ruben, E.A., Chapman, M.S. & Evanseck, J.D. Hydrogen Bonding Mediated by Key Orbital Interactions Determines Hydration Enthalpy Differences of Phosphate Water Clusters; **Journal of Physical Chemistry A**, 111: 10804-14 (2007). PMID: 17915844.
79. Ruben, E.A., M.S. Chapman, and J.D. Evanseck, Anomeric effect in "high energy" phosphate bonds – selective destabilization of the scissile bond and modulation of the exothermicity of hydrolysis. **J Am Chem Soc**, 130: 3349-58 (2008). PMID: 18302368.
80. Xie, Q., Ongley, H. M., Hare, J., and Chapman, M. S. (2008). Crystallization and preliminary X-ray structural studies of adeno-associated virus serotype 6. **Acta Crystallogr Sect F Struct Biol Cryst Commun** 64: 1074-8. PMID: 18997346; PMC2581704.
81. O'Donnell, J., Taylor, K. A., and Chapman, M. S. (2009). Adeno-Associated Virus and its Primary Cellular Receptor - Cryo-EM structure of a Heparin Complex. **Virology**: 385: p. 434-443. PMID: 19144372; PMC2684845.
82. Lerch, T.F., Xie, Q., Ongley, H.M., Hare, J. and Chapman, M.S. (2009). Twinned Crystals of Adeno-associated Virus Serotype 3b Prove Suitable for Structural Studies. **Acta Crystallogr Sect F Struct Biol Cryst Commun**. 65: 177-83. PMID: 19194015; PMC2635862.
83. Boudko, S. P., T. Sasaki, J. Engel, T. F. Lerch, J. Nix, M. S. Chapman, and H. P. Bachinger. 2009. Crystal structure of human collagen XVIII trimerization domain: A novel collagen trimerization Fold. **J Mol Biol** 392:787-802. PMID: 19631658; PMC3048824.
84. Davulcu, O., P. F. Flynn, M. S. Chapman, and J. J. Skalicky. 2009. Intrinsic domain and loop dynamics commensurate with catalytic turnover in an induced-fit enzyme. **Structure** 17:1356-67. PMID: 19836335; PMC2826323.
85. Lerch, T. F., Q. Xie, and M. S. Chapman. 2010. The structure of adeno-associated virus serotype 3B (AAV-3B): Insights into receptor binding and immune evasion. **Virology**, 403: 25-36. PMID: 20444480; PMC2885149.
86. Chapman, M. S., and T. Somasundaram. 2010. De-icing: recovery of Diffraction Intensities in the presence of Ice Rings. **Acta Cryst. D., Biol. Cryst.** 66: 741-4. PMID 20516627.
87. Mitchell, D.A.J., Lerch, T.F., Hare, J.T. & Chapman, M.S. 2010. A *pseudo*-Plaque method for Infectious Particle Assay and Clonal Isolation of Adeno-associated Virus. **J. Virological Methods**, 170: 9-15. PMID: 20708035; PMC2981658.
88. Niu, X., Brüsweiler-Li, L., Davulcu, O., Skalicky, J.J. Brüsweiler, R. and Chapman, M.S. 2011. Arginine Kinase. Joint Crystallographic & NMR RDC Analyses link Substrate-Associated Motions to Intrinsic Flexibility. **J. Molecular Biology** 405: 479-496. PMID: 21075117; PMC3017626.
89. Whittaker, M.M., Lerch, T.F., Kirillova, O., Chapman, M.S. & Whittaker, J.W. 2011. Subunit dissociation and metal binding by Escherichia coli apo-manganese superoxide dismutase. **Arch Biochem Biophys** 505: 213-225. PMID: 21044611; PMC3018548.
90. Wirz, J., Boudko, S. P., T. F. Lerch, M. S. Chapman, and H. P. Bachinger. 2011. Crystal structure of the human collagen XV trimerization domain: A potent trimerizing unit common to multiplexin collagens. **Matrix Biology** 30: 9-15. PMID: 20932905; PMC3048825.
91. Bush, D. J., Kirillova, O., Clark, S. A., Davulcu, O., Fabiola, F., Xie, Q., Somasundaram, T., Ellington, W. R. & Chapman, M. S. (2011). The structure of

- lombicine kinase: implications for phosphagen kinase conformational changes. **Journal of Biological Chemistry** 286: 9338-9350. PMID: 21212263; PMC3058953.
92. Davulcu, O., Skalicky, J. J. & Chapman, M. S. (2011). Rate-Limiting Domain and Loop Motions in Arginine Kinase. **Biochemistry** 50: 4011-4018. PMID: 21425868; PMC2826323.
93. Xie, Q., T.F. Lerch, N.L. Meyer, and M.S. Chapman (2011). *Structure-function analysis of receptor-binding in adeno-associated virus serotype 6 (AAV-6)*. **Virology** 420(1): p. 10-19. PMID 21917284; PMC3185213.
94. Lerch, T.F. and M.S. Chapman (2012). *Identification of the heparin binding site on adeno-associated virus serotype 3B (AAV-3B)*. **Virology** 423: p. 6-13. PMID 22169623; PMC3253896.
95. McCraw, D., J. O'Donnell, K.A. Taylor, S.M. Stagg, and M.S. Chapman (2012). *Structure of adeno-associated virus-2 in complex with neutralizing monoclonal antibody A20*. **Virology** 431: 40-49. PMID: 22682774; PMC3383000
96. Lerch, T.F., J. O'Donnell, N.L. Meyer, Q. Xie, K.A. Taylor, S.M. Stagg, and M.S. Chapman (2012). *Structure of AAV-DJ, a Retargeted Gene Therapy Vector: Cryo-Electron Microscopy at 4.5Å resolution*. **Structure** 20: 1-11. PMID: 22727812; PMC3418430.
97. Clark, S. A., Davulcu, O. & Chapman, M. S. (2012). *Crystal structures of arginine kinase in complex with ADP, nitrate, and various phosphagen analogs*. **Biochemical and Biophysical Research Communications** 427: 212-217, doi:10.1016/j.bbrc.2012.09.053 (2012). PMID: 22995310; PMC3480318.
98. Summerton, J.C., Evanseck, J.D. & Chapman, M.S. (2012) *Hyperconjugation-mediated solvent effects in phosphoanhydride bonds*. **J. Phys. Chem. A** 116: 10209-17. PMID 23009395.
99. Boudko, S.P., Y. Ishikawa, T.F. Lerch, J. Nix, M.S. Chapman, and H. Bächinger (2012), *Crystal structures of wild-type and mutated cyclophilin B that causes hyperelastosis cutis in the American quarter horse*. **BMC Research Notes** 5: 1-6. PMID: 23137129.
100. Chapman, M.S., A. Trzynka, and B.K. Chapman (2013), *Atomic Modeling of cryo-Electron Microscopy Reconstructions - Joint refinement of Model and Imaging Parameters*. **Journal of Structural Biology** 182:10-21. PMID 23376441.
101. Davulcu, O., Niu, X., Bruschiweiler-Li, L., Bruschiweiler, R., Skalicky, J. J., and Chapman, M. S. (2013) Backbone resonance assignments of the 42 kDa enzyme arginine kinase in the transition state analogue form, **Biomol NMR Assign**. July 2013: 1-4. PMID: 23893440.
102. Zhang, F., Aguilera, J., Beaudet, J., Xie, Q., Lerch, T., Davulcu, O., Colon, W., Chapman, M., Linhardt, R. (2013) *Characterization of Interactions between Heparin/Glycosaminoglycan and Adeno-associated Virus*. **Biochemistry** 52: 6275-85. PMID: 23952613; PMC3859860.
103. Xie, Q., Spilman, M., Meyer, N.L., Lerch, T.F., Stagg, S.M. and Chapman, M.S. (2013) *Electron Microscopy Analysis of a Disaccharide Analog complex Reveals Receptor Interactions of Adeno-Associated Virus*, **J. Struct. Biol.** 184: 129-135. PMID 24036405.
104. Boudko, S. P., Ishikawa, Y., Nix, J., Chapman, M. S., and Bächinger, H. P. (2014) *Structure of human peptidyl-prolyl cis-trans isomerase FKBP22 containing two EF-hand motifs*, **Protein Science**, 23: 67-75. PMID 24272907.
105. Stagg, S.M., A.J. Noble, M. Spilman and M.S. Chapman (2014). ResLog plots as an empirical metric of the quality of cryo-EM reconstructions. **J. Struct. Biol.** 185: 418-26. PMID 24384117.

106. Summerton, J.C., Martin, G.M., Evanseck, J.D. and Chapman, M.S. (2014). *Common Hydrogen Bond Interactions in Diverse Phosphoryl Transfer Active Sites*. **PLoS-One**, 9: e108310. DOI: 10.1371/journal.pone.0108310.
107. Chapman, B.K., Davulcu, O., Skalicky, J.J., Brüsweiler, R.P. and Chapman, M.S. (2015). Parsimony in Protein Conformational Change, **Structure**, 23: 1190-1198. doi:10.1016/j.str.2015.05.011.
108. Spear, J.M., Noble, A.J., Xie, Q., Sousa, D.R., Chapman, M.S., and Stagg, S.M. (2015). *The influence of frame alignment with dose compensation on the quality of single particle reconstructions*. **J Struct Biol** 192, 196-203. doi:10.1016/j.jsb.2015.09.006.
109. Pillay, S¹., Meyer, N.L.¹, Puschnik, A.S., Davulcu, O., Diep, J., Ishikawa, Y., Jae, L.T., Wosen, J.E., Nagamine, C.M., Chapman, M.S.², and Carette, J.E.² (2016). *An essential receptor for adeno-associated virus infection*. **Nature** 530, 108-112. ¹Co-1st / ²corresponding authors. doi:10.1038/nature16465.
110. Godsey, M.H., Davulcu, O., Nix, J., Skalicky, J.J., Brüsweiler, R.P. and Chapman, M.S. (2016). The Sampling of Conformational Dynamics in Ambient-Temperature Crystal Structure of Arginine Kinase, **Structure** 24: 1658-67. <http://dx.doi.org/10.1016/j.str.2016.07.013>
111. Earley, L.F., Powers, J.M., Adachi, K., Baumgart, J.T., Meyer, N.L., Xie, Q., Chapman, M.S., Nakai, H. (2017). *Adeno-Associated Virus Assembly-Activating Protein Is Not an Essential Requirement for Capsid Assembly of AAV Serotypes 4, 5 and 11*. **J. Virol.** 91 (3), in press. doi:10.1128/JVI.01980-16.
112. Xie, Q., Noble, A.J., Sousa, D.R., Meyer, N.L., Davulcu, O., Zhang, F., Linhardt, R.J., Stagg, S.M., Chapman, M.S. (2017). *The 2.8 Å Electron Microscopy Structure of Adeno-Associated Virus-DJ Bound by a Heparanoid Pentasaccharide*. **Mol. Ther. Methods Clin. Dev.** 5: 1-12. doi:10.1016/j.omtm.2017.02.004.
113. Peng, Y., Hansen, A.L., Brusweiler-Li, L., Davulcu, O., Skalicky, J.J., Chapman, M.S. and Brüsweiler, R.P. (2017). *The Michaelis Complex of Arginine Kinase Samples the Transition State at a Frequency that Matches the Catalytic Rate*. **J. Am. Chem. Soc.**, 139: 4846-4853; doi:10.1021/jacs.7b00236 PMID: 28287709.
114. Pillay, S., Zou, W., Cheng, F., Puschnik, A.S., Ganaie, S.S., Deng, X., Wosen, J.E., Davulcu, O., Yan, Z., Engelhardt, J.F., Brown, K.E., Chapman, M.S., Qiu, J. and Carette, J.E. (2017) *AAV2 and AAV5 interact with separate domains of the multi-serotype AAV receptor, AAVR*. **J. Virol.**, in press.
115. Davulcu O., Peng Y., Brüsweiler R., Skalicky J.J. and Chapman M.S.. *Elevated μ s-ms timescale backbone dynamics in the transition state analog form of arginine kinase*. (2017) **J. Struct. Biol.**, in press. <http://doi.org/10.1016/j.jsb.2017.05.002>.

RESEARCH MENTORING

| Name | Program | Dates | Subsequent employment |
|-------------------|-----------------------------|--------------|--|
| Genfa Zhou | Ph.D., Molecular Biophysics | 1994 – 1998 | Post-doc, Harvard U.; now CEO FusoGen Pharmaceuticals, Inc. |
| Eric Blanc | Post-doc. | 1995 - 1998 | Res. staff, Global Phasing, Ltd.; then Res. Sci., European Bioinformatics Inst.; Lecturer, Bioinformatics, Kings Coll. London; Curr.: Bioinformatician, Charité Hosp., Berlin. |
| Jeff Haber | M.S. Biochemistry | 1996 – 1999 | Law school, U. Michigan; Private practice, Washington, DC. |
| Qing Xie | Ph.D., Biochemistry | 1993 – 2000 | Snr. Res. Assoc., Oregon Health & Science University |
| Zhi Chen | Ph.D., Physics | 1994 - 2000 | Post-doc., Howard Hughes Medical Inst. & Brandeis University; Res. Assoc., MIT (2009-13). Assist. Prof. Oregon Health & Science Univ. |
| Richard Bertram | Post-doc. | 1999 – 2001 | Assist. Professor (2001-5); Assoc. Prof. (2005-9); Prof. & Director Biomedical Math, Florida State Univ. (2009-) |
| Pam Pruetz | Post-doc. | 1996 – 2002 | Staff scientist, Univ. Alabama at Birmingham |
| Mohammad Yousef | Ph.D., Molecular Biophysics | 1998 – 2002 | Post-doc., HHMI/Univ. Oregon then Assist Prof. Biophysics, Univ. Cairo (July 2006). Res. Assoc. Texas Tech. U. (2009-11); Assist. Prof., Dept. Physics, Southern Illinois Univ. (2011-6); Assoc. Prof. (2016-) |
| Arezki Azzi | Post-doc. | 1999 – 2003 | Staff Scientist, Laval Univ., Canada; Prof. Biochem./Mol. Biol., Al-Imam Mohammad ibn Saud Univ., Saudi Arabia |
| Smita Bhatia | Ph.D., Molecular Biophysics | 1997 – 2003 | Post-doc., National Research Council, Canada; curr. Snr. Manager, Economics & Environment, Chemical Industry Assoc. of Canada. |
| Andrei Korostelev | Ph.D., Biochemistry | 1999 – 2003 | Post-doc., FSU; Post-doc. UC Santa Cruz. ('04-10); Assoc. Prof., U. Mass., Worcester. |

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|--------------------|-------------------------------------|---------------|---|
| Jim Gattis | Ph.D., Biochemistry, | 1997– 2004 | Post-doc., National Cancer Inst. '04-'08; Principle Scientist, Glaxo Smith-Kline ('08-'09); Group Leader, PPDi (2010-2); Snr. Scientist, Liquidia Technologies (2012-). |
| Jared Pikus | M.S., Biochemistry | 2003- 04 | DO, Philadelphia Coll. Osteopathic Med., 2009; Resident, Utah Valley Family Medical Residency Prog. (2009-12), Family Physician, Cottonwood, ID (2012-). |
| Shawn Clark | Ph.D., Biochemistry | 1998– 2006 | Res. Assist, then post-doc fellow, Harvard Univ. & Max Planck Inst. ('04-'07); Senior Scientist, XTAL Biostructures ('07- 13); President & Chairman DeltaTm Technologies Inc. |
| Felcy Fabiola | Post-doc. | 2000- 06 | Home-maker; Consultant (2006-); Systems Project Analyst, Florida Board of Governors (2016-) |
| Weishu Bu | Ph.D., Molecular Biophys. | 1999– 2007 | Post-doc. Univ. Michigan ('07-09); Res. Assoc. Veterans Admin, Ann Arbor, MI ('09-); Instructor, Washtenaw Comm. Coll., Ann Arbor, MI ('13-). |
| Donald "Jeff" Bush | Ph.D., Biochem. | 1999– 2007 | Post-doc., Univ. Alabama, Birmingham (2007-8); Chemist-3, Dept. Agriculture & Consumer Affairs, State of Florida. |
| Pankaj Pal | B.S. Biochemistry, Honors thesis | 2003– 07 | M.D./Ph.D. Washington Univ., 2007-15 Marjorie Schooch (φβφ) fellow; Resident, Internal Medicine, Beth Deaconess Hosp. |
| Eliza Ruben | Ph.D., Molecular Biophys. | 2000– 07 | Post-doc., Stanford Univ (2007-12); Staff Sci., Stanford Univ. (2012-13) Director, Protein Expression Core, Univ. Oklahoma (2013 -) |
| Omar Davulcu | Ph.D., Biochemistry | 2002– 07 | Post-doc., Snr. Res. Assoc., Oregon Health & Sciences Univ. |
| Dan Mitchell | Ph.D., Molecular Biophys., 6/08 | 2000– 08 | NRC Associate, US Army Medical Res. Inst. of Infectious Diseases (2008-11); Staff Sci., Texas Biomed. Res. Inst. (2011-). |
| Heather Ongley | M.S. Biochemistry | 2003- 08 | Jnr. Dental Assist., Broward Co., Florida |

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|-------------------------|--|-----------|---|
| Jason O'Donnell | Ph.D. Biochemistry | 2003-4/09 | Post-doc., Florida State Univ. (2009-11); Post-doc. Univ. Georgia (2011-4); Lecturer, Univ. Georgia (2014-) |
| Olga Kirillova | Post-doc. | 2008-11 | ICOLL LLC. Founder, 2011-13; Rentrak Corp., Data analytics software, 2013 - |
| Sudha Dorairaj | Post-doc. | 2010-11 | Adjunct Assist. Prof., Univ. Portland; Mother, San Diego. |
| Dustin McCraw | Ph.D. Biochemistry & Molecular Biology | 2005-12 | Post-doc., Natl. Inst. Allergy & Infectious Diseases (2013 -) |
| Thomas F. Lerch | Post-doc. | 2007-12 | Senior Scientist, Pfizer, St. Louis |
| Jean C. Summerton | Ph.D. Biochemistry & Molecular Biology | 2007-14 | Post-doc., Onco-Tools, LLC. Philomath, OR (2014 -) |
| Chiara Del Piccolo | Ph.D. Biochemistry & Molecular Biology | 2014-16 | Personal leave / withdrawn. |
| Geoffrey Diemer | Post-doc. | 2015-16 | Snr. Assoc. Scientist, Vaccine & Gene Therapy Inst., OHSU (2016-) |
| Undergraduate students: | | 43 | 1993-2017 |

TEACHING

| Course Title | Level | Credit hours | Role | Enrollment | Comment | |
|--|-------------------------|---------------------|--|-------------------|---------------------------------------|------------------------|
| <i>Enzyme Structure & Function:</i> | Grad. | 3 | Instructor, whole course | 20 - 30 | Redesigned | 1994 – 2005 (annual) |
| <i>Macromolecular Crystallography:</i> | Grad. | 3 | Instructor, whole course | 10-22 | New course | 1993 – 2006 (biannual) |
| <i>General Chemistry:</i> | U-Grad. | 3 | Instructor, whole course | 150 | | 1995 |
| <i>General Biochemistry II:</i> | U-Grad. | 3 | Instructor, whole course | 75 - 140 | | 1999, 2005 |
| <i>Medical Biochemistry:</i> | Medical student | 3 | Lecturer (1 of 6); case-based learning facilitator | 40 | New course | 2002, 2003 |
| <i>Bioinformatics:</i> | Grad / U-grad. | 2 | Coordinator, 2003, Lecturer (1 of 6) | 12 | New course | 2002, Sp '03, Fa '03 |
| <i>Molecular Biophysics and Experimental Bioinformatics:</i> | Grad | 3 | Lecturer (1 of 9) | 9 | CONJ668 | Sp 2007-17 |
| <i>PMCB Journal Club:</i> | Grad | 2 | Lecturer / Facilitator | 17 | CONJ605 – Faculty team | Fa 2008 |
| Cell Structure & Function | Medical student | | Facilitator | 20 | Faculty team | Fa 2009-10 |
| HHMI Biophysics Workshop | Faculty / Grad / U-grad | | Instructor | 12 | 4 x 3-hr workshops on crystallography | Fa 2009 |
| Introductory Biophysics | Grad / U-grad | | Course director, Instructor | 12 | New course, team-taught | Winter 2011-13 |
| Advanced Biophysics | Grad / U-grad | | Course director, Instructor | 10 | New course, team-taught | Spring 2011-12 |
| Biophysics Book Club | Grad / Post-doc | | Faculty mentor | 15 | New "journal club" | 2011-12 academic year |
| <i>Gene & Cell Therapy</i> | Grad | | Team instructor | 10 | | 2013 - (annual) |

| | | | | | |
|------------------------------------|-----------------|----------------------------|-----|------------|----------------|
| Fundamentals of Medicine | Medical student | Team Lecturer, Facilitator | 139 | New course | Fa 2014 |
| Foundations of Measurement Science | Grad | Developer, Team Lecturer | 6 | New course | Fa 2014-15 |
| Analysis in Quantitative Science | Grad | Developer, Team Lecturer | 3 | New course | Winter 2015-17 |

SEMINARS & CONFERENCE TALKS

The Path of the Polypeptide Backbone of Ribulose-1,-5-bis-phosphate from Nicotiana tabacum, in International Workshop on Ribulose-1,-5-bis-phosphate carboxylase-oxygenase, 1987, Tuscon, AZ.

The Partial Structure of Ribulose-1,5-Bisphosphate Carboxylase Oxygenase (RuBisCO). in Annual meeting, American Crystallographic Association. 1986. Hamilton, Ontario, Canada.

Sequence-Structure Correlations among Picornaviruses and to Parvoviruses. in American Society for Virology. 1992.

The Refined Structure of Canine Parvovirus Full Particles. in 5th Parvovirus Workshop. 1993. Crystal River, FL.

Structure, Sequence, and Function Correlations among Parvoviruses. in 5th Parvovirus Workshop. 1993. Crystal River, FL.

The refined structure of canine parvovirus: DNA-protein interactions and encapsidation, in American Society for Virology. 1994: Madison, WI.

Single-stranded DNA-protein interactions in the refined structure of canine parvovirus (CPV), in American Crystallographic Association, Annual meeting. 1994: Atlanta, GA.

Structural Studies of Parvoviruses. in VIth Parvovirus Workshop. 1995. Montpellier, France: Societe Francais de Microbiologie.

Parvoviral Structure in VIth Parvovirus Workshop. 1995. Montpellier, France: Societe Francais de Microbiologie.

Ab Initio Phase Determination for Viruses: The Use of Non-Crystallographic Symmetry for Phase Refinement. in XVII Congress and General Assembly of the International Union of Crystallography. 1996. Seattle, WA

Real space refinement. in Gordon Research Conference: Diffraction Methods in Molecular Biology. 1996. Proctor Academy, NH.

Towards an Engineered Anti-Cancer Virus: Crystallographic Investigation of Adeno-Associated Virus (AAV). in American Cancer Society, Florida Division Inc., Research Seminar. 1996. Orlando, FL.

Icosahedral Virus Structure: The Devil in the Detail. Quasi-equivalence: Motion and Adaptability in Living Molecules, 1997, Tallahassee, FL.

Seminar: Baxter Health Products Inc., (1997);

Seminar: Targeted Genetics Inc. (1997);

Seminar: Chemistry Departmental, Florida State University (1997);

Electron Density Representation and Real Space Refinement (New tricks from an old dog)., in International Union of Crystallography Workshop on Computing Techniques, 1997, Bellingham, WA.

Introduction to the use of non-crystallographic symmetry in phasing. in NATO Advanced Study Institute on Direct Methods for Solving Macromolecular Structures. 1997. Erice, Italy.

Use of non-crystallographic symmetry for ab initio phasing of virus structures. in NATO Advanced Study Institute on Direct Methods for Solving Macromolecular Structures. 1997. Erice, Italy.

Structural Studies of Cellular Energy Buffering and Virus-Drug Complexes. in Florida Division of the American Chemical Society. 1997. Orlando, FL.

Real-space refinement in Computing in Crystallography & NMR, Cold Spring Harbor Symposium, 1997.

Real-Space Refinement Using RSRef. in NATO Advanced Study Institute on Direct Methods for Solving Macromolecular Structures. 1997. Erice, Italy.

Preliminary Crystal Characterization of Adeno-Associated Virus 2. in 7th International Parvovirus Workshop. 1997. Heidelberg, Germany.

Seminar FSU/FAMU Chemical Engineering (1998);

Seminar: Florida Southern College (1998);

Seminar: Florida State University Martech (1998);

Seminar: Mercer College (1998);

Transition State Structure of Arginine Kinase: Implications for the Enzyme Catalysis of Bimolecular Reactions. American Chemical Society, Florida Division, 1999, Orlando, FL.

Seminar: Rutgers University (1999);

Seminar: University of South Florida (2000).

Towards the Atomic Structure of the Adenoassociated Virus 2 Capsid. in VIII th Parvovirus Workshop. 2000. Mt. Tremblant, Canada

Seminar: Eastern Carolina University (2002);

Seminar: California State University, Fullerton (2002);

Real-Space Simulated Annealing Refinement - A tool in model-building and a paradigm for holistic refinement. in Interdisciplinary Workshop Promoting Collaboration In High-Throughput X-ray Structure Determination. 2002. Santa Fe, NM: Los Alamos National Laboratory.

Seminar: ETH – Zurich (2002);

The Atomic Structure of Adeno-Associated Virus 2 at 3.0 Å Resolution. in The IX Parvovirus Workshop. 2002. Bologna, Italy.

Seminar: Beckman Institute & Dept. Physics, Univ. Illinois at Urbane-Champaign, 2003.

Fitting known structures to EM maps - real-space refinement with stereochemical restraints. Gordon Research Conference: 3D Electron Microscopy, 2003.

Far from the MADing crowd: infectious and reactionary research. SERCAT Symposium, Univ. Alabama at Birmingham, 2004.

Seminar: Structural Enzymology of Arginine Kinase - a Paradigm for the Catalysis of Two-Substrate Reactions, Dept. Biochemistry & Molecular Biology, Indiana University Medical School, 2004.

Adeno-associated Virus – Structural studies of a gene therapy vector. National Synchrotron Light Source Workshop: Anatomy of a Virus, 2004

Holistic Macromolecular Models – When One Technique is Not Enough. Keynote lecture, EMSL 2004 Workshop; Pacific Northwest Laboratories.

The Structure of AAV. FASEB meeting: Virus Assembly, 2004

Viral Engineering – Where Biology meets Physics. Joint meeting of the National Societies for Black and Hispanic Physicists (2005).

Seminar: Still Learning about Enzyme Catalysis with Arginine Kinase, Ctr. for Biomolecular Structure & Dynamics, University of Montana, 2005.

Seminar: New tricks from an old dog; The structural enzymology of arginine kinase., Dept. Biochemistry & Molecular Biology, Oregon Health Sciences University, 2006.

Seminar: New tricks from an old dog; The structural enzymology of arginine kinase., Dept. Biochemistry & Molecular Biology, Wayne State University, 2006.

Seminar: New tricks from an old dog; The structural enzymology of arginine kinase., Dept. Biochemistry & Molecular Biology, University of Georgia, 2006.

NCS and Bias in free R-factors. in Gordon Research Conference: Diffraction Methods in Structural Biology, Lewiston, ME, 2006.

Structure and Function of Adeno-Associated Virus Capsids. in The XIth Parvovirus Workshop. 2006. Les Diablerets, Switzerland.

Seminar: More than Structure: Stereoelectronics and Dynamics in Arginine Kinase, Oregon State University, 2008.

Seminar: More than Structure: Stereoelectronics and Dynamics in Arginine Kinase, University of Colorado Health Science University, 2008.

Seminar: More than Structure: Stereoelectronics and Dynamics in Arginine Kinase, Oregon Graduate Institute, 2008.

Accuracy of Pseudoatomic models fit into Cryo-Electron Microscopy Density Reconstructions, Hybrid Methods conference, Tahoe, CA, 2008.

Accuracy of Pseudoatomic models fit into Cryo-Electron Microscopy Density Reconstructions, Maxinf2 Workshop: New algorithms in Macromolecular Crystallography and Electron Microscopy, Leiden, Netherlands, 2008.

Structural Studies of Adeno-Associated Viruses: Crystal Structure of AAV-6 and Electron Microscopy of AAV-2 Complexed with Heparan Sulfate Analogs, XII Parvovirus Workshop, Córdoba, Spain, 2008.

Workings of Arginine Kinase – Crystallographic, NMR & Quantum Mechanical Studies, West Coast Protein Crystallography Workshop, Asilomar, CA, 2009.

Seminar: Workings of Arginine Kinase – Crystallographic, NMR & Quantum Mechanical Studies, Uppsala University, Sweden, 2009.

Nearly Natural – A Structural Foundation for Viral-based DNA Delivery Vectors, Micro Nano Breakthrough Conference, Portland, OR, 2009

Seminar: Beyond Structure - A Dynamic Enzyme!, Reed College, 2009

Structural Studies with Implications for Cell Attachment. XIIIth Parvovirus Workshop (Helsinki, Finland, 2010).

Hybrid Structure Refinement Algorithms: Precisely is the Point. In Gordon Research Conference: 3D Electron Microscopy; New London, NH., 2011

DNA delivery targeted to the liver. In Oregon Nanoscience and Microtechnologies Institute Conference, Portland, 2011

Improving delivery in Human Gene Therapy. Imaging Adeno-Associated Virus at near-atomic resolution. In Biomedicine in 4D; Portland, OR, 2012

Structure of the Retargeted Vector, AAV-DJ. In IXth Parvovirus Workshop, Ithaca, NY, 2012

Gene Therapy Delivery: Interactions of AAV Vectors at near-atomic resolution. Dept. Biomedical Engineering, Oregon Health & Sciences University, 2012.

Visualizing Molecular Specificity in the Targeting of AAV Gene Therapy Vectors. OHSU Center for Spatial Systems Biomedicine, 2013.

Vector Delivery: AAV's 1st Cellular Encounters. OHSU Gene Therapy Symposium, 2013.

Seminar: Arginine Kinase – A Dynamic Enzyme. Lewis & Clark University, 2014.

AAV Attachment – Binding and Structural Studies. In Xth Parvovirus Workshop, Bordeaux, France, 2014

Functional Dynamics during Induced Fit Turnover. Oregon State University, 2014.

Seminar: Cell Entry by Adeno-Associated Virus. Dept. Biochem. & Mol. Biol., Oregon Health & Science University, 2015.

An Essential & Ubiquitous Protein Receptor for AAV; Glycans as Attachment Receptors. Invited talk: Presidential Symposium of Am. Soc. Gene & Cell Therapy, 2016.

An Essential & Ubiquitous Protein Receptor for AAV; Glycans as Attachment Receptors. In XIth Parvovirus Workshop, Ajaccio, France, 2016

Adeno-Associate Virus: Cell Entry. Caspar Structural Biology Symposium, Florida State University, 2017.

Seminar: Visualizing & Modeling Conformational Flexibility. Dept. Biochem. & Mol. Biol., Oregon Health & Science University, 2017.

Seminar: Seeing and believing: AAV and the cellular entry of a gene therapy vector. Dept. Biochem. & Mol. Biol., Indiana University, 2017.

Rate-limiting conformational change along the reaction path of an enzyme. BioNMR Symposium, Oregon State University, 2017.