Dr. Christopher D. Snow

Associate Professor
Department of Chemical & Biological Engineering
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Education and Training

Postdoc. Chem.E.	CALIFORNIA INSTITUTE OF TECHNOLOGY		2006-2011
Ph.D. Biophysics	STANFORD UNIVERSITY		2001-2006
Sc.B. Chemistry	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	4.9/5.0	1997-2001

Research Experience

CURRENT RESEARCH OVERVIEW

- Engineering protein crystals for catalysis, guest structure determination, template-delimited growth of guest inorganic nanostructures, biosensors, therapeutic drug delivery, virus detection, DNA barcodes, RNA delivery
- Computation-guided design of self-assembling protein and nucleic acid systems.
- Enzyme engineering for enhanced olfaction

POSTDOCTORAL RESEARCH

- Cytochrome P450 structure determination & prediction with Prof. Frances Arnold 2006-2011
- Computational protein structure prediction
- Cellulase enzyme library design

GRADUATE RESEARCH

- Protein folding via distributed computing with Prof. Vijay Pande 2001-2006
- RNA-antibiotic NMR with Prof. Joseph Puglisi 2002
- Simulated annealing fragment MC with Prof. Michael Levitt 2001

Awards and Honors

Nelson Family Faculty Excellence Award	2019
CSU Alumni Association Best Teacher Award	2019
George T. Abell Outstanding Early Career Faculty Award	2015
KAUST Postdoctoral Fellowship	2008-2011
Jane Coffin Childs Postdoctoral Fellowship	2006-2008
NSF Bioinformatics Postdoctoral Fellowship (declined)	2006
Protein Society Best Poster Awards	2004-2005
HHMI Predoctoral Fellowship	2001-2006
NSF Predoctoral Fellowship (declined)	2001
Phi Beta Kappa	2001
Outstanding Chemistry Research Achievement by a MIT Undergraduate	2001
Hypercube Computational Chemistry Award	2001

Publications [2001-2006] Christopher D. Snow

1. Absolute comparison of simulated and experimental protein-folding dynamics
CD. Snow, H. Nguyen, VS. Pande, M. Gruebele
Nature (2002) 420(6911), 102-6 568 Citations. Impact Factor 50.0

2. Simulation of folding of a small alpha-helical protein in atomistic detail using worldwide-distributed computing
B Zagrovic, CD. Snow, MR. Shirts, VS. Pande
J. Mol. Biol. (2002) 323(5), 927-37 237 Citations. Impact Factor 5.7

3. The Trp Cage: Folding Kinetics and Unfolded State Topology via Molecular Dynamics Simulations
CD. Snow, B. Zagrovic, VS. Pande
J. Am. Chem. Soc. (2002) 124(49), 14548-9 221 Citations. Impact Factor 15.4

4. Native-like Mean Structure in the Unfolded Ensemble of Small Proteins
B. Zagrovic, CD. Snow, S. Khaliq, MR. Shirts, VS. Pande
J. Mol. Biol. (2002) 323(1), 153-64 159 Citations. Impact Factor 5.7

5. Atomistic protein folding simulations on the submillisecond time scale using worldwide distributed computing
VS. Pande, I. Baker, J. Chapman, S. Elmer, SM. Larson, YM. Rhee, MR. Shirts, CD. Snow, EJ. Sorin, B .Zagrovic
Biopolymers (2002) 68(1): 91-109 252 Citations. Impact Factor 2.5

6. Surface Salt Bridges, Double-Mutant Cycles, and Protein Stability: an Experimental and Computational Analysis of the Interaction of the Asp 23 Side Chain with the N-Terminus of the N-Terminal Domain of the Ribosomal Protein L9
DL. Luisi, CD. Snow*, J. Lin, ZS. Hendsch, B. Tidor, DP. Raleigh.
Biochemistry (2003) 42(23), 7050-60 63 Citations. Impact Factor 3.2

7. Trp zipper folding kinetics by molecular dynamics and T-jump spectroscopy
CD. Snow, L. Qiu, D. Du, F. Gai, SJ. Hagen, VS. Pande
Proc. Natl. Acad. Sci. USA (2004) 101(12), 4077-82 177 Citations. Impact Factor 11.2

8. Using path sampling to build better Markovian state models: Predicting the folding rate and mechanism of a tryptophan zipper beta hairpin
N. Singhal, CD. Snow, VS. Pande
J. Chem. Phys. (2004) 121(1) 415-25 216 Citations. Impact Factor 3.5

9. How well can simulation predict kinetics and thermodynamics of protein folding?
CD. Snow, E. Sorin, YM. Rhee, VS. Pande
Annu. Rev. Biophys. and Biomol. Struct. (2005) 34, 43-69 202 Citations. Impact Factor 13.0

10. Direct calculation of the binding free energies of FKBP ligands
H. Fujitani, Y. Tanida, M. Ito, G. Jayachandran, CD. Snow, MR. Shirts, EJ. Sorin, VS. Pande
J. Chem. Phys., (2005) 123, 084108 158 Citations. Impact Factor 3.5

11. Dimerization of the p53 oligomerization domain: Identification of a folding nucleus by molecular dynamics simulations
LT. Chong, CD. Snow, YM. Rhee, VS. Pande
J. Mol. Biol. (2005) 345(4), 869-78 33 Citations. Impact Factor 5.7

12. Electric fields at the active site of an enzyme: direct comparison of experiment with theory
IT. Suydam, CD. Snow, VS. Pande, SG. Boxer
Science (2006) 313, 200-4 253 Citations. Impact Factor 47.7

13. Kinetic definition of protein folding transition state ensembles and reaction coordinates
CD. Snow, YM Rhee, Vijay S. Pande
Biophys. J. (2006) 91, 14-24 29 Citations. Impact Factor 4.0

14. Computer Simulations of Protein Folding
VS Pande, EJ Sorin, CD Snow, YM Rhee
Protein Folding, Misfolding and Aggregation: Classical Themes and Novel Approaches. Royal Society of Chemistry: Cambridge (2008) Chapter 8 1 Citation

15. A diverse family of thermostable cytochrome P450s created by recombination of stabilizing fragments
Y. Li, DA. Drummond, AM. Sawayama, CD. Snow, JD. Bloom, FH. Arnold
Nature Biotechnology (2007) 25(9), 1051-6 107 Citations. Impact Factor 54.9

16. Hunting for predictive computational drug-discovery models
CD. Snow. *Expert Reviews in Anti-Infective Therapy* (2008) 6(3), 291-3 1 Citations. Impact Factor 3.8

17. Evolutionary History of a Specialized P450 Propane Monooxygenase
R. Fasan, Y. Meharenna, CD. Snow, T. Poulos, FH. Arnold
J. Mol. Biol. (2008) 383(5), 1069-80 148 Citations. Impact Factor 5.7

18. Side-chain recognition and gating in the ribosome exit tunnel
P. Petrone, CD. Snow, D. Lucent, VS. Pande
Proc. Natl. Acad. Sci. USA (2008) 105(43), 16549-54 64 Citations. Impact Factor 11.2

19. A Family of Thermostable Fungal Cellulases Created by Structure-Guided Recombination
P. Heinzelman, CD. Snow, I. Wu, C. Nguyen, A. Villalobos, S. Govindarajan, J. Minshull, FH. Arnold
Proc. Natl. Acad. Sci. USA (2009) 106(14), 5610-15 186 Citations. Impact Factor 11.2

20. SCHEMA Recombination of a Fungal Cellulase Uncovers a Single Mutation that Contributes Markedly to Stability
P. Heinzelman, CD. Snow, MA. Smith, X. Yu, A. Kannan, A. Villalobos, S. Govindarajan, J. Minshull, Frances H. Arnold. *J. Biol. Chem.* (2009) 284(39), 26229-33 91 Citations. Impact Factor 5.2

21. SHARPEN: Systematic Hierarchical Algorithms for Rotamers and Proteins on an Expansive Network
IV Loksha*, J Maiolo, C. Hong*, A. Ng*, CD. Snow
J Comp Chem (2009) 30(6), 999-1005 12 Citations. Impact Factor 3.4

22. Efficient Screening of Fungal Cellobiohydrolase Class I Enzymes for Thermostabilizing Sequence Blocks by SCHEMA Structure-Guided Recombination
P. Heinzelman, R. Komor, A. Kannan, PA. Romero, L. Yu, S. Mohler, CD. Snow, FH. Arnold
Protein Eng. Des. Sel. (2010) 23(11): 871-80 75 Citations. Impact Factor 1.8

23. Combinatorial Alanine Substitution Enables Rapid Optimization of Cytochrome P450BM3 for Selective Hydroxylation of Large Substrates
JC. Lewis, SM. Mantovani, Y. Fu, CD. Snow, RS. Komor, CH. Wong, FH. Arnold
Chem. Bio. Chem. (2010) 11(18): 2502-5 72 Citations. Impact Factor 3.2

24. Non-bulk-like Solvent Behavior in the Ribosome Exit Tunnel
D. Lucent, CD. Snow, C. Aitken, SE. Lee, VS. Pande.
PLoS Comput. Biol. (2010) 6(10): e1000963 32 Citations. Impact Factor 4.4

25. Engineered Ketol-acid Reductoisomerase and Alcohol Dehydrogenase Enable Anaerobic 2-methylpropan-1-ol production at Theoretical Yield in Escherichia coli
S. Bastian, X. Liu, JT. Meyerowitz, CD Snow, MM. Chen, FH. Arnold
Metab. Eng. (2011) 13(3): 345-52 197 Citations. Impact Factor 7.8

26. Engineered Bacterial Mimics of Human Drug Metabolizing Enzyme CYP2C9
A. Rentmeister, TR. Brown, CD Snow, MN. Carbone, FH. Arnold
Chem. Cat. Chem. (2011) 3(6): 1065-71 30 Citations. Impact Factor 5.7

27. Polarizable Protein Repacking
AH. Ng* & CD. Snow
J. Comp. Chem (2011) 32(7): 1334-44 4 Citation. Impact Factor 3.4

28. Comparison of Random Mutagenesis and Semi-Rational Designed Libraries for Improved Cytochrome P450 BM3-catalyzed Hydroxylation of Small Alkanes
MM Chen, CD Snow, CL Vizcarra, SL Mayo, FH Arnold
Prot. Engr. Des. Sel. (2012) 25(4): 171-8 64 Citations. Impact Factor 1.8

29. A Diverse Set of Family 48 Bacterial Cellulases Created by Structure-Guided Recombination
M Smith, A Rentmeister, CD Snow, T Wi, M Farrow, F Mingardon, FH Arnold
FEBS Journal. (2012) 279(24): 4453-65 30 Citations. Impact Factor 5.5

30. Structure-Guided Directed Evolution of Highly Selective p450-based Magnetic Resonance Imaging Sensors for Dopamine and Serotonin
EM Brustad, VS Lelyveld, CD Snow, N Crook, ST Jung, FM Martines, TJ Scholl, A Jasanoff, FH Arnold
J. Mol. Biol. (2012) 422(2): 245-62 30 Citations. Impact Factor 5.7

31. Structure-guided Engineering of Lactococcus lactis Alcohol Dehydrogenase LlAdhA for Improved Conversion of Isobutyraldehyde to Isobutanol
X Liu, S Bastian, CD Snow, EM Brustad, TE Saleski, JH Xu, P Meinhold, FH Arnold
J Biotechnol. (2012) 164(2): 188-95 27 Citations. Impact Factor 3.2

32. General approach to reversing ketol-acid reductoisomerase cofactor dependence from NADPH to NADH
S Brinkmann-Chen, T Flock, JK Cahn, CD Snow, EM Brustad, JA McIntosh, P Meinhold, L Zhang, FH Arnold
Proc. Natl. Acad. Sci. USA (2013) 110(27): 10946-51 70 Citations. Impact Factor 11.2

33. Methods for Library-Scale Computational Protein Design
L Johnson, T Huber, CD Snow
Methods in Molecular Biology: Protein Design. Springer. (2014) 1216:129-59 4 Citations

34. Characterization of the Target of Ivermectin, the Glutamate-gated Chloride Channel, from *Anopheles gambiae*
JI. Meyers, M. Gray, W. Kuklinski, LB. Johnson, CD Snow, WC. Black IV, KM. Partin, BD. Foy.
J. Experimental Biology. (2015) 218:1478-86. 40 Citations. Impact Factor 3.3

35. Discriminating between stabilizing and destabilizing protein design mutations via recombination and simulation
LB Johnson, LP Gintner*, S Park**, CD Snow.
Prot. Engr. Des. Sel. (2015) 28(8):259-67 9 Citations. Impact Factor 1.8

36. Conservative and compensatory evolution in oxidative phosphorylation complexes of angiosperms with highly divergent rates of mitochondrial genome evolution
J Havird, N Whitehill, CD Snow, D Sloan
Evolution. (2015) 69(12).3069-81 DOI: 10.1111/evo.12808. 35 Citations. Impact Factor 3.7

37. A Structure Based Design Protocol for Optimizing Combinatorial Protein Libraries
MW Lunt, CD Snow
Methods in Molecular Biology: Protein Design. Springer (2016) Springer. 1414:99-138 3 Citations

38. Gold Nanoparticle Capture Within Protein Crystal Scaffolds
AE Kowalski, TR Huber, TW Ni, LF Hartje, KL Appel*, JW Yost*, CJ Ackerson CD Snow
Nanoscale, (2016), 8(25):12693-6. DOI:10.1039/c6nr03096c. 19 Citations. Impact Factor 7.8

39. Molecular Dynamics Simulations of Cellulase Homologues in Aqueous 1-ethyl-3-methylimidazolium Chloride
LB Johnson, CD Snow
J. Biomol. Struct. Dyn. (2016) DOI:10.1080/07391102.2016.1204364 8 Citations. Impact Factor 3.4

40. Optimizing Shape Complementarity Scoring Parameters for Recognition of Authentic Crystal Packing Arrangements
JA Bennett*, CD Snow
J. Crystal Growth & Design. (2016) 16(9):5579-83. 10.1080/07391102.2016.1204364 Impact Factor 4.1

41. Characterization of Supercharged Cellulase Activity and Stability in Ionic Liquids
LB Johnson, S Park**, LP Gintner*, CD Snow
J. Mol. Catalysis B. (2016). 132: 84-90. 10.1016/j.molcatb.2016.05.008 12 Citations. Impact Factor 2.3

42. Programmed Assembly of Host-Guest Protein Crystals
TR Huber, LF Hartje, EC McPherson*, AE Kowalski, CD Snow
Small. (2016) 13(7). 10.1002/smll.201602703 16 Citations. Impact Factor 13.3

43. An Evolved Orthogonal Enzyme/Cofactor Pair
E Reynolds, M McHenry, F Cannac, CD Snow, EM Brustad
J. Am. Chem. Soc. (2016) 138(38):12451-8. 10.1021/jacs.6b05847 25 Citations. Impact Factor 15.4

44. Adsorption-Coupled Diffusion of Gold Nanoclusters within a Large-Pore Protein Crystal Scaffold.
LF Hartje, B Munsky, TW Ni, CJ Ackerson, CD Snow
J. Phys. Chem. B. (2017) 121(32):7652-9. 10.1021/acs.jpcb.7b03999 9 Citations. Impact Factor 3.0

45. Installing Guest Molecules at Specific Sites within Scaffold Protein Crystals
TR Huber, EC McPherson*, CE Keating*, CD Snow
Bioconjug. Chem. (2018) 29(1):17-22. 10.1021/acs.bioconjchem.7b00668 11 Citations. Imp.Fac. 4.8

46. Characterizing the Cytocompatibility of Various Cross-Linking Chemistries for the Production of Biostable Large-Pore Protein Crystal Materials
LF Hartje, HT Bui, DA Andales*, SP James, TR Huber, CD Snow
ACS Biomat. Sci. & Eng. (2018) 4(3):826-31. 10.1021/acsbiomaterials.8b00023 10 Cit. Imp.Fac. 4.7

47. Synthesis of Luminescent Lanthanide Complexes within Crosslinked Protein Crystal Matrices
Y Zhang, X Zhang, J Tang, CD Snow, G Sun, AE Kowalski, LF Hartje, N Zhao, Y Wang, L Belfiore
Cryst. Eng. Comm. (2018) 20:2267-77. 4 Citations. Impact Factor 3.5

48. Porous Protein Crystals as Scaffolds for Enzyme Immobilization
AE Kowalski, LB Johnson, H Dierl*, S Park*, TR Huber, CD Snow
Biomaterials Science (2018) 7, 1898 19 Citations. Impact Factor 6.8

49. Enhancing the Power Conversion Efficiency for Polymer Solar Cells by Incorporating Luminescent Nanosolid Micelles as Light Converters
D Wang, W Shen, J Tang, Y Wang, J Liu, X Wang, R Yang, CD Snow, L Huang, J Jiao, Y Wang, W Wang, LA Belfiore.
ACS Appl. Energy Mater. (2018) 1(4):1445-1454 3 Citations. Impact Factor 6.0

50. Protein Crystal Based Materials for Nanoscale Applications in Medicine and Biotechnology
LF Hartje, CD Snow
WIREs Nanomedicine and Nanobiotechnology. (2018) 10.1002/wnan.1547 10 Cit. Impact Factor 9.4

51. Advancing Biomarkers for Anaerobic O-xylene Biodegradation via Metagenomic Analysis of a Methanogenic Consortium
K Rossmassler, CD Snow, B Taggart, C Brown, SK De Long.
Appl. Microbiol. & Biotech. (2019) 103(10):4177-4192 3 Citations. Impact Factor 3.5

52. Drug Sensing of Protein Crystals Doped with Luminescent Lanthanide Complexes
Sun G, Tang J, Snow CD, Li Z, Zhang Y, Wang Y, Belfiore LA
Crystal Growth and Design (2019) 19(10): 5658-5664. 10.1021/acs/cgd.9b00642 6 Cit. Imp.Fac. 4.1

53. Porous crystals as scaffolds for structural biology
Ward A, Snow CD
Current Opinion in Structural Biology (2020) 60: 85-92 9 Citations. Impact Factor 6.8

54. Near infrared emitting and biocompatible Yb^{3+}-DNA complexes with dual responses to Cu^{2+} and Fe^{3+}.
Li Z, Sun G, Snow CD, Xu Y, Wang Y, Xiu D, Zhang U, Zhu Z, Belfiore LA, Tang J.
Optical Materials (2020) 108: 110157 10.1016/j.optmat.2020.110157 2 Citations. Impact Factor 3.1

55. Design of genetically-encoded sensors to detect nucleosome ubiquitination in live cells.
Passos CDS, Choi Y-S, Snow CD, Cohen RE, Yao T.
*Journal of Cell Biology (*2021) 220(4). 2 Citations. Impact Factor 10.5

56. Histidine polypeptide-hybridized nanoscale metal-organic framework to sense drug loading/release.
Yanan X, Zhenhua L, Xiu D, Sun G, Snow CD, Wang Y, Wang Y, Belfiore LA, Tang J.
Materials & Design (2021) 205: 109741. 1 Citations. Impact Factor 8.0

57. Measuring interactions of DNA with nanoporous protein crystals by atomic force microscopy.
Wang D, Stuart JD, Jones AA, Snow CD, Kipper MJ.
Nanoscale (2021) 13(24): 10871 Impact Factor 7.8

58. Stable Fluorescence of Eu^{3+} Complex Nanostructures Beneath a Protein Skin for Potential Biometric Recognition
Zhao Y, Yao Z, Snow CD, Xu Y, Wang Y, Xiu D, Belfiore LA, Tang J.
Nanomaterials (2021) 11(9): 2462 Impact Factor 4.9

59. Stabilizing DNA-Protein Co-Crystals via Intra-Crystal Chemical Ligation of the DNA
Ward AR, Dmytriw S, Vajapayajula A, Snow CD.
Crystals (2021) 12(1): 49 Impact Factor 2.6

60. Mosquito Tagging Using DNA-Barcoded Nanoporous Protein Crystals
JD Stuart, DA Hartman, LI Gray, AA Jones, NR Wickenkamp, C Hirt, A Safira, AR Regas, TM Kondash, ML Yates, S Driga, CD Snow, RC Kading.
Preparing for (re)submission

61. Protein Crystals as Molds for Seeded Gold Nanorod Growth
AE Kowalski, R Nemeth, S Zintgraff*, S Sloan*, TR Huber, P Ciesielski, CJ Ackerson, CD Snow
Preparing for (re)submission

62. Textile Functionalization by Porous Protein Crystal Conjugation and Guest Molecule Loading
LF Hartje, DA Andales, LP Gintner*, LB Johnson, YV Li, CD Snow
Preparing for (re)submission

Key: *Undergraduate author, **Pre-collegiate author

Citation Summary (ResearcherID Report: L-5624-2013)

Statistics generated on curated list: including only journal articles and book chapters

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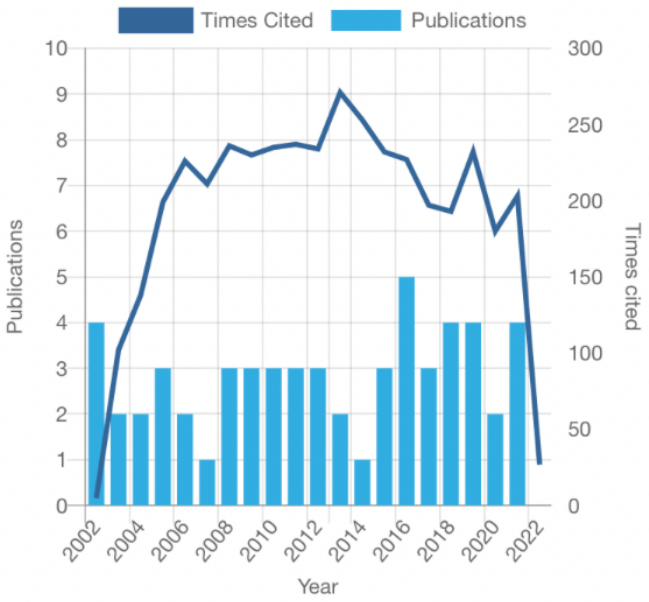

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57	4,068	29	71.4	193.7

Citations are from articles indexed in the Web of Science Core Collection.
Read more about the Web of Science Core Collection here.

Selected Conference Abstracts & Poster Presentations

1. Elucidating the role of electrostatic interactions in protein folding and stability: A combined experimental and computational approach.
DP Raleigh, JH Cho, ZS Hendsch, JC Horng, B Kuhlman, DL Luisi, V Moroz, S Sato, CD Snow, B Tidor. *American Chemical Society*. (2002).

2. Directly calculated ligand binding free energies using Folding@Home.
MR Shirts, G Jayachandran, CD Snow, et al. *National Meeting of the American Chemical Society*. Philadelphia (2004)

3. Directly calculated ligand binding free energies using Folding@Home.
MR Shirts, CD Snow, VS Pande. *National Meeting of the American Chemical Society*. Anaheim. (2004)

4. Exploring the kinetics and mechanism of millisecond protein folding with molecular dynamics.
CD Snow, VS Pande. *18th Symp. of the Protein Society*. San Diego. (2004).

5. Unfolding and refolding the p53 oligomerization domain dimer: molecular dynamics studies in explicit water. LT Chong, CD Snow, Y Rhee et al. 18th *Symp. of the Protein Society*. San Diego. 2004.

6. Binding energy calculation for FKBP receptor and ligands by generalized bar method.
H Fujitani, Y Tanida, M Ito et al. *National Meeting of the American Chemical Society*. Mar 13-17. San Diego. (2005)

7. Direct calculation of absolute free energies of ligand binding without knowledge of the bound state.
MR Shirts, G Jayachandran, H Fujitani, et al. *National Meeting of the American Chemical Society*. San Diego. 2005.

8. Binding energy calculation for theophylline-RNA aptamer with generalized bar method.
Y Tanida, M Ito, H Fujitani, et al. *National Meeting of the American Chemical Society*. San Diego. 2005.

9. Quantifying the conformational space of FKBP ligand binding.
MR Shirts, CD Snow, G Jayachandran et al. *National Meeting of the American Chemical Society*. 2006.

10. Explicit and implicit solvation binding free energies of FKBP-12.
MR Shirts, G Jayachandran, CD Snow et al. *National Meeting of the American Chemical Society*. 2007.

11. SCHEMA recombination reveals structural characteristics of active variants of Hypocrea jecorina Cel5a.
M Farrow, TM Lee, CD Snow et al. *National Meeting of the American Chemical Society*. Denver. 2011

12. SCHEMA structure-guided recombination in engineering cellulase families for biomass-to-biofuel conversion processes
P Heinzelman, CD Snow, R Komor, I Wu, M Smith, P Romero, FH Arnold. *National Meeting of the American Chemical Society*. Anaheim. 2011.

13. Focused library design via combinatorial optimization of degenerate codons.
CD Snow. *National Meeting of the American Chemical Society*. Anaheim. 2011.

14. High-Resolution Models from Low Resolution Data: Recombination of Fragments for Crystallographic Structure Determination. CD Snow. *26th Symp. of the Protein Society*. San Diego (2012)

15. GPU-accelerated algorithms for sampling protein crystal forms.
CD Snow. *27th Symposium of the Protein Society*. Boston (2013)

16. Dissecting Contributions to Protein Stability Via Recombination of a Wild Type and Computationally Designed Protein.
L Johnson, L Gintner, L Minardi, CD Snow. *28th Symp. of* the *Protein Society*. San Diego (2014)

17. Beyond Glutaraldehyde: The Search for Optimal Chemical Crosslinkers for Protein Crystals
TR Huber, J Sebesta, CD Snow. *28th Symp. of the Protein Society*. San Diego (2014)

18. Library-scale evaluation of a computational design and thermostable cellulase.
LB Johnson (oral presenter), LP Gintner*, S Park**, CD Snow. *249th ACS National Meeting*. Denver (2015)

19. Engineering Porous Protein Crystals as Scaffolds for Programmed Assembly
TR Huber, LF Hartje, CD Snow. *29th Symp. of the Protein Society*. Barcelona (2015)

20. Engineering Porous Protein Crystals as Scaffolds for Programmed Assembly
TR Huber, LF Hartje, AE Kowalksi, LB Johnson, JC Sebesta, CD Snow. 30*th Symp. of the Protein Society*. Baltimore (2016)

21. Engineering Porous Protein Crystals as Scaffolds for Programmed Assembly
TR Huber, LF Hartje, AE Kowalksi, LB Johnson, JC Sebesta, CD Snow. *Gordon Research Conference: Bioinspired Materials*. Les Diablerets, Switzerland (2016)

22. Characterizing Large-Pore Protein Crystals for Advanced Material Applications
LF Hartje, BE Munsky, HT Bui, DA Andales, CD Snow. 62*nd Annual Meeting of the Biophysical Society* (2018)

23. Modular and Expandable Protein-DNA Co-crystal Scaffolds to Assist in X-ray Diffraction of DNA-Binding Macromolecules
A Ward, CD Snow. 33*rd Symp. of the Protein Society*. (2019)

24. Textile functionalization by porous protein crystal conjugation and guest molecule loading
LF Hartje, D Andales, L Gintner, L Johnson, L Yan, CD Snow. 257*th ACS National Meeting.* Orlando (2019).

25. Modular and Expandable Protein-DNA Co-crystal Scaffolds to Assist in X-ray Diffraction of DNA-Binding Molecules
A Ward, E Shields, S Dmytriw, A Vajapayajula, CD Snow. 35*th Symp. of the Protein Society*. (2021)

26. Chemical DNA ligaton templated by a DNA-binding protein scaffold
S Dmytriw, A Vajapayajula, A Ward, CD Snow. 35*th Symp. of the Protein Society*. (2021)

27. Development of porous protein nanocrystals as a delivery vector for DNA and RNA
A Jones, M Masri, CD Snow. 35*th Symp. of the Protein Society*. (2021)

28. Quantifying Protective Effects of Engineered Porous Protein Crystals on Adsorbed Guest RNA
M Masri, CD Snow, A Jones. 35*th Symp. of the Protein Society*. (2021)

29. Porous Protein Crystal Scaffolds for Peroxidase Pixel Detectors
L Beatty, A Jones, CD Snow. 35*th Symp. of the Protein Society*. (2021)

PATENTS

U.S. Provisional Patent Application No. 62/128,384, “Optimized E1 Endoglucanase Sequence” assigned to CSURF.

U.S. Provisional Patent Application No. 62/748,213, “Isoreticular Co-Crystals” assigned to CSURF.

U.S. Provisional Patent Application No. 63/111,927, “Crosslinked Porous Protein Crystals with Guest Barcode DNA”, assigned to CSURF

U.S. Patent 10590176. "Engineering Programmable Molecular Scaffolds from Porous Protein Crystals” assigned to Colorado State University Research Foundation

GRANT SUPPORT

Validating Computational Design Principles for Crystalline Enzyme Assemblies.
American Chemical Society: Petroleum Research Fund. 52404-DNI10. $100,000 direct
9-1-2012 to 8-31-2014. Snow (PI)

SBIR Phase II: Real-Time Biosensor for Measuring Hazardous Chemical Contaminants in Groud Water
National Science Foundation IIP 1431003 Subcontract $28,971
8-1-2014 to 7-31-2016. PI for subcontract

Highly Parallel Synthesis of Nanostructures Inside Crystalline Protein Scaffolds
National Science Foundation. CMMI 1434786 $350,000
9-1-2014 to 8-31-2017. Snow (PI)

Programmed Assembly of Conductive Protein Crystals
National Science Foundation. DMR 1506219 $357,437
9-1-2015 to 8-31-2018. Snow (PI)

EAGER: Coherent Guest Protein Organization Inside Host Protein Crystals
National Science Foundation. CHEM CMI 1645015 $100,000
9-1-2016 to 2-28-2018. Snow (PI)

Tuning Interfacial Biomolecule Interactions with Massively Parallel Nanopore Arrays
National Science Foundation. CBET BEINM, $439,341
7-15-2017 to 6-30-2020. Snow (Co-PI)

Innovative Platforms for In Vivo Molecular Tagging and Editing
Colorado State University OVPR $200,000
1-1-2018 to 12-31-2019 Snow (PI)

Innovative Platforms for In Vivo Molecular Tagging and Editing
Colorado State Advanced Industries OEDIT POC $106,666
1-1-2018 to 12-31-2018 Snow (PI)

Assessing Arthropod Labeling and Transmission of Protein Crystals Containing DNA Barcodes Optimized for Next-Generation Sequencing
Colorado Clinical and Translational Sciences Institute $28,584
4-1-2019 to 4-30-2021 Kading (PI), Snow (Co-I)

Development of a Platform to deliver RNA
US Dep. of Agriculture / Nat. Wildlife Res. Center APP-7694 $300,000
9-30-2018 to 9-29-2022 Snow (PI)

Nasal Microbiome Engineering for Enhanced Olfaction
DOD, Office of Naval Research GRANT12762737 $749,898
3-1-2019 to 9-30-2022 Snow (PI), Peebles (Co-I)

STTR Phase I: Enzyme design for economical feed additives from sugar
National Science Foundation STTR 1914098 / Sasya LLC $225,000
7-1-2019 to 6-30-2020 Vemuri (PI), Snow (subcontract PI)

Surveillance of mosquito and arbovirus dispersal using smart microcrystals

National Institutes of Health NIH NIAID R21AI146740 $404,532
7-1-2019 – 6/30/2021 Kading (PI), Snow (Co-I)

Nelson Family Faculty Excellence Award
CSU College of Engineering $60,000
09/01/2019 – 8/31/2022 Snow (PI)

Integrating barcoded microcrystal technology with ongoing West Nile virus surveillance
CSU College Research Council $24,998
10/2021 – 09/2022 Kading (PI), Snow (Co-PI)

Tracking mosquito movements from birth to bite
CSU One Health Institute $3,148
05/2021 – 08/2021 (PI: VandeWoude)

Starting in 2015, I began to collaborate with and visit Dr. Jianguo Tang at Qingdao University. He has obtained several PRC grants to supported visits from foreign experts, provide a per diem during visits, and otherwise support foreign expert advising of Qingdao University graduate students.

Research on key technologies for biological and energy applications of natural polysaccharide hybrid materials
State Administration of Foreign Experts Affairs, PRC RMB 180,000
1-1-2017 to 12-31-2017 Tang (PI), Snow (one visiting expert)

Research on the key technology and the bio-energy application of high-efficiency luminescent hybrid bio-molecular materials
State Administration of Foreign Experts Affairs, PRC RMB 240,000
1-1-2018 to 12-31-2018 Tang (PI), Snow (one visiting expert)

Research on the key technology and the bio-energy application of high-efficiency luminescent hybrid bio-molecular materials
Shandong Administration of Foreign Experts Affairs, PRC RMB 200,000
1-1-2019 to 12-31-2019 Tang (PI), Snow (one visiting expert & sabbatical guest)

Research on the key technology and the bio-energy application of high-efficiency luminescent hybrid bio-molecular materials
State Administration of Foreign Experts Affairs, PRC pending
1-1-2020 to 12-31-2020 Tang (PI), Snow (consulting foreign expert)

生物大分子组装高效发光材料的研发. **~Development of high-efficiency luminescent materials from biomacromolecule assemblies**
PRC Ministry of Science and Technology MOST 2017YFE0108300 RMB 1,000,000
1-1-2018 to 12-31-2020 Tang (PI), Snow (one visiting expert & sabbatical guest)

Clonable Nanoparticles
National Institutes of Health NIH NIGMS R01 GM137139 $1,183,632
4-1-2020 to 3-31-2024 Ackerson (PI), Snow (Co-I)

Designed Expanded Co-Crystals for Guest Structure Determination
National Science Foundation NSF DMR BMAT 2003748 $422,890

09/01/2020 – 08/31/2023 Snow (PI)

Scott Bioengineering Systems and Synthetic Biology (SSB) Pod Molecular Biology Expansion
Colorado State University OVPR $25,000
2-1-2021 to 6-30-2021 Snow (Co-PI)

MURALS First Year Scholar Pilot Program
Colorado State University Office of the Provost $2,000
8-1-2021 to 12-31-2021 Snow (PI)

Multiplexed imaging of viral protein processing and assembly in live cells
National Institutes of Health NIH NIAID R56 AI155897-01A1 $517,692
8-6-2021 to 7-31-2022 Snow (PI), Stasevich (PI), Geiss (Co-I)

COVID-19: Defining the Translocation Mechanisms of SARS-CoV-2 nsp13 Helicase to Aid in Antiviral Development
National Institutes of Health NIH NIAID 1 R01 AI166050-01 $2,229,089
8/2021 – 7/2026 (PIs: McCullagh, Geiss, Co-I Snow)

Transformative pandemic response infrastructure: an integrated device for automated wastewater sampling and simultaneous molecular capture of infectious agents
Anschutz Foundation $200,000
10/2021 – 9/2023 De Long (PI), Wilusz (co-PI), Snow (co-PI)

Tracking mosquito movements from birth to bite
CSU One Health Institute $4,800
05/2021 – 08/2021 (PI: VandeWoude)

INVITED TALKS (Selected)

- BYU 2021
- The 5th International Conference on Molecular Simulation 2019
- KAIST 2019
- Tokyo Institute of Technology 2019
- Kansas University 2019
- Hybrid Materials Symposium: Qingdao University 2017
- NSF Nanoscale Science and Engineering Grantees Conference 2016
- Dartmouth 2016
- UNC Chapel Hill 2016
- Colorado School of Mines 2015
- United States Army Natick Soldier Research, Development, and Engineering 2015
- Protein Society Topical Panel Discussion 2015
- Protein Society Topical Panel Discussion 2013
- Kansas State University 2013
- UC Boulder Seminar Series 2012
- National Renewable Energy Laboratory 2012
- Society for Industrial Microbiology – Biocatalysts By Design 2011
- American Chemical Society – Emerging Topics in Protein Engineering 2011
- MIT, University of Michigan, WUSTL, Boston University 2011
- Caltech Sustainable Energy Conference, Einstein COM, U British Columbia, Stanford, NIH 2010
- Princeton, Yale, Stanford, Cornell, MIT, Berkeley, Monash University 2010

TEACHING

Numerical evaluation (mean course survey score for instructor categories)

CBE310: Molecular Concepts and Applications

Fall 2020	Course surveys changed to eliminate the numerical scores
Fall 2018	4.37 / 5.00
Fall 2017	4.74 / 5.00

CBE201: Material and Energy Balances

Fall 2012	4.28 / 5.00
Fall 2013	4.77 / 5.00
Fall 2014	4.65 / 5.00
Fall 2015	4.72 / 5.00
Fall 2016	4.72 / 5.00
Fall 2017	4.60 / 5.00

CBE570: Biomolecular Engineering & Synthetic Biology

Spring 2013	4.85 / 5.00
Spring 2014	4.76 / 5.00
Spring 2015	4.86 / 5.00
Spring 2017	4.83 / 5.00

Developed this course, which covers enough practical biomolecular design methods to allows students to pursue a variety of creative biomolecular design projects

BIOM570: Bioengineering. Fall 2011-2018, 2020 Guest lecturer
Covered lectures on pharmaceutical development, introduction to therapeutic macromolecules, and drug transport and metabolism

AGRI601: Bioenergy Technology. Fall 2012, Fall 2013, Fall 2014 Guest lecturer
Provided lecture/lab in the area of biomass depolymerization technology

SERVICE

American Institute of Chemical Engineers Faculty Advisor	2015 - 2016
School of Biomedical Engineering Seminar Committee	2015 - 2016
Engineering Student Technology Committee:	2013 – 2015, 2017 – 2018
BIOMOD Student Organization Advisor:	2017 -

Grant Review/Referee:

- Vidi Research Proposal Review, December 2013
- NSF Proposal Panel Review, December 2014
- NSF Proposal Review, February 2015
- E-Rare Transnational Research Projects on Rare Diseases Proposal Review, August 2015
- Israel Science Foundation Proposal Review, May 2016
- NSF Panel Review, February 2016
- NSF Proposal Review, May 2016
- ACS PRF Proposal Review, July 2016
- NSF Proposal Review, Feb 2021

Major Advisor for the Following Students:

- Ph.D. program, Abigail Ward, Sixth-Year, Chemistry
  Area of Study: Co-crystal Engineering
- Ph.D. program, Julius Stuart, Fifth-Year, Chemistry
  Area of Study: Protein Crystal Sensors, Biophysics, and DNA Barcoding
- Ph.D. program, Alec Jones, Fourth-Year, Bioengineering
  Area of Study: Protein Crystal Sensors, RNA Delivery
- Ph.D. program, Jacob DeRoo, Third-Year, Bioengineering *[Joint Advisor]*
  Area of Study: Atomic Force Microscopy of Porous Protein Crystals
- Ph.D. program, Szu-Hsuan Chen, Second-Year, Chem. Bio. Engr.
  Area of Study: Host-guest crystal transport modeling
- M.S. program, Mahmoud Masri, Fourth-Year, Chem. Bio. Engr.
  Area of Study: RNA Delivery
- M.S. program, Michael Scroggins, Third-Year, Bioengineering
  Area of Study: Enzyme engineering for olfactory sensing
- Ph.D. program, Ethan Shields, First-Year, Bioengineering
  Area of Study: Co-crystal Engineering & olfactory sensing
- Ph.D. program, Rojina Shrestha, First-Year, Cell & Molecular Biology Program
  Area of Study: Enzyme crystallography
- Ph.D. program, Rachel Cohen, First-Year, Chemistry
  Area of Study: Enzyme engineering
- Ph.D. program, Callie Slaughter, First-Year, Cell & Molecular Biology Program
  Area of Study: Co-crystals, DNA barcodes

Group Alumni

- Ph.D. program, Dafu Wang, Fourth-Year, SAMD *[Joint Advisor]*
  Area of Study: Atomic Force Microscopy of Porous Protein Crystals
- Ph.D. program, Angeline Ta *[late stage advisor]*
  Thesis (2018): Protein Engineering for Therapeutic Strategies and Tools
- Ph.D. program, Ann Kowalski
  Thesis (2018): Protein Crystals as Nanotemplating Materials
- Ph.D. program, Luke Hartje
  Thesis (2018): Characterizing Porous Protein Crystal Materials for Applications in Nanomedicine and Nanobiotechnology
- Ph.D. program, Thaddaus Huber
  Thesis (2017): Towards Macromolecular Scaffold Assisted Crystallography
- Ph.D. program, Lucas Johnson
  Thesis (2016): Engineering Stabilized Enzymes
- M.S. program, Mark Lunt
  Thesis (2015): Software for the Use of Protein Fragment Recombination and Regression in Protein Structure Determination and Design
- M.S. program, Jacob Sebesta
  Thesis (2015): Software to Design Crosslinks for Specific Protein Crystal Stabilization
- Postdoctoral Fellow, Gayani Dedduwa-Mudalige
  Area of Study (2018): Fluorescent Protein Engineering

Professional Memberships

- Protein Society
- American Chemical Society
- AAAS
- AIChE
- Society for Biological Engineering (AIChE community)

Pre-Collegiate Outreach

In collaboration with Ethan Dusto, an AP Chemistry teacher at Cherry Creek High School and Steve Albers, (i) a Ph.D. student in the Chemical and Biological Engineering department, (ii) a former high school teacher in the Creek school district (Denver) and, (iii) a recent recipient of an AFRI-NIFA fellowship to implement Synthetic Biology educational outreach within 2 Colorado school districts, the Snow laboratory developed a module to aid in visualization and understanding of intermolecular forces and their importance in protein folding and stability. Background information regarding hydrogen bonds, electrostatic interactions, and hydrophobic packing were introduced in parallel with tradition AP Chemistry content over a series of four video lectures that I produced. At the end of the unit, students designed their own experiment to study the effects of changing environmental conditions on the activity of a relevant human health enzyme, pepsin. We have also worked with several high-school summer interns.

Undergraduate Research Service

I serve as a faculty mentor for a CSU student organization (CSU BIOMOD). With assistance from a Ph.D. student in my group we assembled a team of undergraduate students (and a summer high school intern) to conduct innovative biomolecular design and assembly research. BIOMOD is an international biomolecular design competition. In our first year, nearly the entire team (8 undergraduates) as well as the graduate student mentor accompanied me to the Jamboree at UCSF. The CSU students had ample opportunities to talk about highly creative research projects with other student scientists from across the globe. In our first year, we competed well with respect to established, highly polished programs, ultimately reaching the middle “silver” tier according to the evaluations of the students’ presentation, explanatory video, and website. In addition to attending regular BIOMOD meetings, I provide the students with laboratory access and materials.

Synergistic Activities

1. Development of Open-Source Computational Tools for Protein Research*:* Dr. Snow is actively developing (2007-) an open-source software library, SHARPEN (www.sharp-n.org), for protein modeling and design. This software was designed from the ground up to enable non-programmers to contribute to the development of new algorithms. Whereas academic software is often limited by insufficient documentation, we have built an interactive online training resource (DrillBits). The DrillBits tutorial website also encompasses Linux, Python, Matlab, and PyMOL, key tools necessary to transform undergraduate students into effective undergraduate researchers. These free, online resources build off my previous efforts with the Folding@Home distributed computing project (2001-2006), where I implemented the database that tracked the molecular dynamics simulation contributions of hundreds of thousands of volunteers.

2. Interdisciplinary Collaborations with groups outside my lab include the development of hybrid lanthanide protein crystals with Dr. Jianguo Tang at Qingdao University, generating structural models of protein evolution with Dr. Dan Sloan at Colorado State University, developing algorithms for the detection and quantification of cavities in protein structures with Dr. Eric Brustad at the University of North Carolina at Chapel Hill, developing multifunctional materials for integration into textiles with a team at the United States Army Natick Soldier Research, Development, and Engineering Center, and development of next-generation fluorescent protein probes for intracellular imaging with Drs. Tim Stasevich and Brian Geiss at CSU, and developing multifunctional materials for integration into textiles with a team at the United States Army Natick Soldier Research, Development, and Engineering Center. Most recently, we have also initiated a collaboration with Dr. Rebekah Kading at CSU to deploy DNA-laden engineered microcrystals for mosquito tracking. We are also collaborating with Dr. Katherine Horak at the National Wildlife Research Center to evaluate use of our crystals for the oral delivery of RNA. We are also collaborating with Dr. Christopher Ackerson (CSU Chemistry) to develop proteins that catalyze the formation of nanoparticles inside living cells for electron microscopy. Broad interdisciplinary interests of the group have also led to zero-time appointments in the Department of Biochemistry & Molecular Biology, the Department of Chemistry, the School of Biomedical Engineering, the School of Advanced Materials Discovery, and the Graduate Program in Cell and Molecular Biology.

3. Curriculum Development: Dr. Snow has developed (2013-) a new Colorado State University Chemical and Biological Engineering course: CBE570*: Biomolecular Engineering & Synthetic Biology* focused on student-led design challenge projects. This course draws interdisciplinary interest across the University, bringing together motivated students from the Chemical and Biological Engineering department, the Biochemistry and Molecular Biology department, and beyond. To learn best practices as a new teacher, the PI attended the ASEE Summer School for Chemical Engineering Faculty in 2012.

4. Student-Facing Service Contributions: Dr. Snow served as faculty representative for the student chapter of the American Institute of Chemical Engineers (AIChE, 2015-2016), and faculty member of the Engineering Student Technology Committee (2013-2015, 2017-2018).

5. Professional Society Contributions: Dr. Snow is a longtime member and contributor to the Protein Society, with annual Symposium attendance from 1998. Contributions include a chaired symposium session on applied protein research (2016), career development panel sessions (2016 and 2015), a panel session on the future of rational protein design and directed evolution (2013), poster judging service (2007-2015), and best poster awards (2004, 2005). Since 2019, Dr. Snow is the chair of the Abstracts Committee.

6. **Community Service Contributions:** In 2020, Dr. Snow took a position on the Editorial Board of the journal Crystals. He also became an Associate Senior Editor for the journal Protein Engineering, Design, and Selection.