

# Dr. Christopher D. Snow

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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 biomolecular crystals for catalysis, guest structure determination, templating inorganic nanostructures, biosensors, therapeutic drug delivery, virus detection, edible barcodes, RNA delivery
- Computation-guided design of self-assembling protein and nucleic acid systems.
- Enzyme engineering for intracellular nanoparticle synthesis, allosteric switch enzymes
- Computational design of binding proteins, especially proteins for intracellular targets

### 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

**1. Absolute comparison of simulated and experimental protein-folding dynamics**

CD. Snow, H. Nguyen, VS. Pande, M. Gruebele  
*Nature* (2002) 420(6911): 102-6

595 Citations. Impact Factor 55.0

**2. 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 4.9

**3. 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

247 Citations. Impact Factor 4.9

**4. 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

227 Citations. Impact Factor 15.5

**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

259 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

65 Citations. Impact Factor 2.8

**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

183 Citations. Impact Factor 10.6

**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

237 Citations. Impact Factor 3.8

**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

207 Citations. Impact Factor 15.1

**10. 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 4.9

**11. 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(8): 084108

173 Citations. Impact Factor 3.8

**12. Hunting for predictive computational drug-discovery models**

CD. Snow. *Expert Reviews in Anti-Infective Therapy* (2008) 6(3), 291-3

1 Citation. Impact Factor 4.9

**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

34 Citations. Impact Factor 3.1

**14. 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

302 Citations. Impact Factor 49.7

**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

125 Citations. Impact Factor 59.5

**16. 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

**17. 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

73 Citations. Impact Factor 10.6

**18. Evolutionary History of a Specialized P450 Propane Monooxygenase**

R. Fasan, Y. Meharena, CD. Snow, T. Poulos, FH. Arnold  
*J. Mol. Biol.* (2008) 383(5), 1069-80

175 Citations. Impact Factor 4.9

**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

202 Citations. Impact Factor 10.6

**20. 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

14 Citations. Impact Factor 4.2

**21. 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

102 Citations. Impact Factor 4.3

**22. 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

36 Citations. Impact Factor 4.3

**23. 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

79 Citations. Impact Factor 2.6

**24. 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

88 Citations. Impact Factor 3.0

**25. Polarizable Protein Repacking**

AH. Ng\* & CD. Snow  
*J. Comp. Chem* (2011) 32(7): 1334-44

4 Citations. Impact Factor 4.2

**26. 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

236 Citations. Impact Factor 7.8

## Publications [2011-2016]

Christopher D. Snow

### 27. 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

38 Citations. Impact Factor 4.2

### 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

72 Citations. Impact Factor 2.6

### 29. 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

38 Citations. Impact Factor 4.9

### 30. 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

33 Citations. Impact Factor 5.6

### 31. 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

97 Citations. Impact Factor 10.6

### 32. Structure-guided Engineering of *Lactococcus lactis* Alcohol Dehydrogenase LIAdhA 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

36 Citations. Impact Factor 3.8

### 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*

Jl. Meyers, M. Gray, W. Kuklinski, LB. Johnson, CD Snow, WC. Black IV, KM. Partin, BD. Foy.

*J. Experimental Biology.* (2015) 218(10): 1478-86.

62 Citations. Impact Factor 2.7

### 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 2.6

### 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.

63 Citations. Impact Factor 3.1

### 37. 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.

26 Citations. Impact Factor 5.6

### 38. 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

2 Citations

### 39. 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 3.4

## Publications [2016-2019]

Christopher D. Snow

### 40. 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

28 Citations. Impact Factor 15.5

### 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. 10.1016/j.molcatb.2016.05.008

14 Citations. Impact Factor 1.8

### 42. 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

11 Citations. Impact Factor 2.7

### 43. 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

26 Citations. Impact Factor 12.5

### 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.jpcc.7b03999

14 Citations. Impact Factor 2.9

### 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.

25 Citations. Impact Factor 4.5

### 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 Biomater. Sci. & Eng.* (2018) 4(3):826-31.

22 Citations. Impact Factor 5.5

### 47. 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

9 Citations. Impact Factor 5.1

### 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(5): 1898

38 Citations. Impact Factor 6.0

### 49. Protein Crystal Based Materials for Nanoscale Applications in Medicine and Biotechnology

LF Hartje, CD Snow

*WIREs Nanomedicine and Nanobiotechnology.* (2018)11(4)

31 Citations. Impact Factor 8.8

### 50. Porous Crystals as Scaffolds for Structural Biology

Ward A, Snow CD

*Current Opinion in Structural Biology* (2020) 60: 85-92

24 Citations. Impact Factor 6.5

### 51. 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).

10 Citations. Impact Factor 7.2

### 52. 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

9 Citations. Impact Factor 5.6

### 53. 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

9 Citations. Impact Factor 2.4

## Publications [2022-2026]

Christopher D. Snow

### 54. 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.  
*PNAS Nexus* (2022)

12 Citations. Impact Factor 3.8

### 55. Scalable Combinatorial Assembly of Synthetic DNA for Tracking Applications

JD Stuart, NR Wickenkamp, KA Davis, C Meyer, RC Kading, CD Snow  
*Int. J. Mol. Sci* (2023) 24(3)

3 Citations. Impact Factor 5.7

### 56. Textile Functionalization by Porous Protein Crystal Conjugation and Guest Molecule Loading

LF Hartje, DA Andales\*, LP Gintner\*, LB Johnson, YV Li, CD Snow  
*Crystals* (2023) 13(2)

5 Citations. Impact Factor 2.4

### 57. Ligand Presentation Inside Protein Crystal Nanopores: Tunable Interfacial Adhesion Noncovalently Modulates Cell Attachment

D Wang, M Hedayati, JD Stuart, LYC Madruga, KC Popat, CD Snow, MP Kipper  
*Materials Today Nano* (2023) 24, 100432

2 Citations. Impact Factor 9.6

### 58. Modular Protein-DNA Co-Crystals as Precise Programmable Assembly Scaffolds

AR Orun, ET Shields, S Dmytriw\*, A Vajapayajula\*, CK Slaughter, CD Snow  
*ACS Nano* (2023) 17(14), 13110-13120

9 Citations. Impact Factor 16.4

### 59. Laboratory Evolution of Substrate Recognition and Nanoparticle Product Size

A Hendricks, R Cohen, G McEwen, T Tien, B Guilliams, A Alspach, CD Snow, C Ackerson  
*ACS Chemical Biology* (2024) 19(2): 289

Impact Factor 4.1

### 60. Porous Protein Crystals: Synthesis and Applications

AA Jones, CD Snow  
*Chem Comm.* (2024) 60, 5790.

9 Citations. Impact Factor 4.1

### 61. Tuning Chemical DNA Ligation within DNA Crystals and Protein-DNA Co-crystals

AR Orun, CK Slaughter, ET Shields, A Vajapayajula\*, S Jones\*, R Shrestha, CD Snow  
*ACS Nanoscience Au.* (2024) 4(5): 338.

5 Citations. Impact Factor 6.6

### 62. Characterization of Guest DNA Transport and Adsorption within Host Porous Protein Crystals

S Chen, JD Stuart, B Munsky, CD Snow  
*Langmuir.* (2024) 40(50): 26443-26454

Impact Factor 3.7

### 63. Automation of Protein Crystallization Scaleup via OpenTrons-2 Liquid Handling

J DeRoo, AA Jones, CK Slaughter, TW Ahr\*, SM Stroup\*, GB Thompson\*, CD Snow  
*SLAS Technology.* (2025) 32, 100268

2 Citations. Impact Factor 3.1

### 64. Deposition of Metal Organic Frameworks within a Porous Protein Crystal Superstructure

J DeRoo, R Shrestha, AA Jones, D Rajendran, JE Thai, RR Tuttle, CD Snow, MM Reynolds  
*J Mater. Chem. B.* (2025) 13(35): 10864

1 Citation. Impact Factor 6.1

### 65. AI-assisted Protein Design to Rapidly Convert Antibody Sequences to Intrabodies Targeting Diverse Peptides and Histone Modifications

G Galindo, D Maejima, J DeRoo, SR Burlingham, G Fixen, T Morisaki, HP Febvre, R Hasbrook, N Zhao, S Ghosh, EH Mayton, CD Snow, BJ Geiss, Y Ohkawa, Y Sato, H Kimura, TJ Stasevich  
*Science Advances.* (2026) 12(1): 10.1126/sciadv.adx8352

2 Citations. Impact Factor 14.1

## Collaborative Publications with Center for International Joint Research for Hybrid Materials Technology at Qingdao University [2018-2026]

### 66. 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 [9 Citations. Impact Factor 2.6](#)

### 67. 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 [8 Citations. Impact Factor 5.9](#)

### 68. 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 [10 Citations. Impact Factor 3.4](#)

### 69. Near Infrared Emitting and Biocompatible Yb<sup>3+</sup>-DNA Complexes with Dual Responses to Cu<sup>2+</sup> and Fe<sup>3+</sup>.

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 [4 Citations. Impact Factor 3.9](#)

### 70. 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. [19 Citations. Impact Factor 8.9](#)

### 71. Stable Fluorescence of Eu<sup>3+</sup> 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 [11 Citations. Impact Factor 4.7](#)

### 72. Conditionally Designed Luminescent DNA Crystals Doped by Ln<sup>3+</sup>(Eu<sup>3+</sup>/Tb<sup>3+</sup>) Complexes or Fluorescent Proteins with Smart Drug Sensing Property

Xiu D, Zhao S, Li Z, Xu Y, Wang Y, Zhe Z, Zhang M, Snow CD, Belfiore LA, Tang J.  
*J Materials Chem. B* (2022) 10(34): 6443 [5 Citations. Impact Factor 6.1](#)

### 73. Lanthanide (Eu<sup>3+</sup>/Tb<sup>3+</sup>)-loaded $\gamma$ -cyclodextrin Nano-Aggregates for Smart Sensing of the Anticancer Drug of Irinotecan.

Guo Y, Liu J, Tang Q, Li C, Zhang Y, Wang Y, Wang Y, Bi Y, Snow CD, Kipper MK, Belfiore LA, Tang J.  
*Int. J. Mol. Sci.* (2022) 23(12): 6597 [8 Citations. Impact Factor 5.7](#)

### 74. Smart Wearable Fluorescence Sensing of Bacterial Pathogens and Toxic Contaminants by Eu<sup>3+</sup>-Induced Sodium Alginate/Ag Nanoparticle Aggregates

Li C, Tang Q, Wei H, Liu J, Wang Q, Wang Y, Du Z, Wang J, Xu R, Bi Y, Snow CD, Belfiore LA, Tang J. (2022) *ACS Appl. Nano Mater.* 5(6): 8393 [21 Citations. Impact Factor 5.6](#)

### 75. Improved Performance for Polymer Solar Cells Through Photon Energy Harvesting and Down-Conversion of Eu<sup>3+</sup>-induced Deblock Polymer Aggregates (EIPAs)

Z Long, S Li, W Shen T Li, Wang Y, S Guo, Kipper MK, Snow CD, Belfiore LA, Tang J.  
*J. Mater. Chem. C.* (2023) 11: 12730 [8 Citations. Impact Factor 5.6](#)

### 76. DNA Hybrid Fluorescent Chrominance Sensor: Drug Sensing Through Direct Gradient Fluorescent Color Transformation of Hybrid DNA Crystals Loaded Lanthanide (Eu<sup>3+</sup>/Tb<sup>3+</sup>) Complexes

Zhao S, Xiu D, Zhang M, Wang Y, Qiu M, Snow CD, Wang Y, Belfiore LA, Tang J.  
*J. Cryst. Growth.* (2024) 630(15): 127582 [2 Citations. Impact Factor 1.8](#)

### 77. A Smart Microporous Block Copolymer Membrane Containing Fluorescent Europium Complexes Reports Drug Release through Fluorescence Changes

Xu R; Wang J; Li Z; Wang B; Shen W; Wang Y; Wang W; Wang Y; Li J; Snow CD; Kipper MJ; Belfiore LA; Tang J. (2024) *J. Mater. Chem. C.* 12(32): 12608 [1 Citations. Impact Factor 5.6](#)

**78. Full Fluorescence Paper of Eu<sup>3+</sup> Induced Diblock Copolymer Nanoaggregates for Negative Multiple Mode Photon Information Storage and Encryption**

Chen W, Tang Q, Xu R, Liu J, Wang Y, Wang W, Wang Y, Snow CD, Kipper MJ, Belfiore LA; Tang J. (2024) *Appl. Mater. Today.* 40: 102416 [6 Citations. Impact Factor 7.4](#)

**79. Smart Cancer Targeting and Super-Sensitive Sensing of Eu<sup>3+</sup>/Tb<sup>3+</sup>-Induced Hyaluronan Characteristic Nanomicelles with Effective Drug Loading and Releasing**

Bi Y; Li L; Liu J; Wang Y; Wang B; Wang Y; Snow CD; Li J; Kipper MJ; Belfiore LA; Tang J (2024) *Molecules.* 29(21): 5070 [2 Citations. Impact Factor 5.0](#)

**80. Doping Styrene Butadiene Rubber with Eu<sup>3+</sup>-Induced Diblock Copolymer Nanoaggregates Enhances Mechanical Properties and Enables Stretching-Enhanced Luminescence**

Gurung G, Tamang SK, Parajuli RK, Snow CD; Kipper MJ; Belfiore LA; Tang J (2024) *ACS Appl. Polym. Mater.* 6(23): 14331 [Impact Factor 5.0](#)

**81. Multilevel Information Encoding of Metal Ion-Induced Fluorescent Nanoaggregates and Full-Color Electrohydrodynamic Printing**

Wang B, Liu J, Shen W, Wang Y, Li J, Zhang Y, Wang Q, Snow CD, Kipper MK, Lee SW, Belfiore LA, Tang J. (2025) *ACS Appl. Polym. Mater.* 7(11): 7322 [Impact Factor 5.0](#)

**82. Enhanced Fluorescence Bioimaging of Water Soluble Conjugated Ruthenium (II) Complex in Vitro/Vivo Oxidoreductase-Overexpressed Tumor Cells**

Li L, Liu J, Xu R, Wang Y, Wang Y, Huang L, Du Z, Snow CD, Xie H, Kipper MJ, Belfiore LA, Tang J. (2025) *Sensors and Actuators B: Chemical.* 444(1): 138387 [Impact Factor 7.4](#)

**83. Luminescent Biosensors via Co-Assembly of Hen Egg White Lysozyme with Eu<sup>3+</sup>/Tb<sup>3+</sup>-Complexes**

Zhang M, Qui M, Li Z, Xu R, Wang Y, Wang W, Snow CD, Kipper MJ, Belfiore LA, Tang J. (2025) *J. Mater. Chem. B.* (2025) 13: 3198 [2 Citations. Impact Factor 6.1](#)

**84. Smart Quadruplicate Information Coding and Hazard Sensing, with Dual UV/IR Excitation, in 2D Fine Images of Eu<sup>3+</sup>/Tb<sup>3+</sup>/Zn<sup>2+</sup> Hyaluronan Nanoaggregates and NaGdF<sub>4</sub>:Yb,Er Nanoparticles**

Liu J, Wang B, Li S, Wang Y, Li J, Zhang Y, Snow CD, Kipper MJ, Lee SW, Belfiore LA, Tang J. *J. Mater. Chem. C.* (2025) 13(37): 19340 [Impact Factor 5.6](#)

**85. High Mechanical and Luminescent Properties of Polyethylene Terephthalate Doped with Eu<sup>3+</sup>-induced Nanoaggregates of Polystyrene-Block-Polyacrylic Acid**

Cheng Z, Niu Y, Yue Y, Shen W, Du Z, Wang Y, Wang Y, Li J, Snow CD, Kipper MJ, Lee SW, Belfiore LA, Tang J. *Materials & Design* (2025) 260: 115169 [Impact Factor 8.9](#)

**86. Strong Efficiency Enhancement of Eu<sup>3+</sup>-Induced Polystyrene-b-Poly (acrylic acid) Nanoaggregates on Bladed Organic Polymer Solar Cells through Doping the Electron Transport Layer**

Guo S, Li S, Shen W, Yue Y, Wang Q, Liu J, Wang Y, Li J, Snow CD, Kipper MJ, Belfiore LA, Lee SW, Tang J. *ACS Applied Energy Mater.* (2025) 8(21): 15661 [Impact Factor 5.9](#)

**87. Selective Doxorubicin Sensing in Urine with Water-Stable Fluorescence of Tb(III)-Induced Polystyrene-b-poly(acrylic acid) Nanoaggregates**

Parajuli RK, Liu J, Tamang SK, Gurung G, Neupane K, Wang Y, Snow CD, Kipper MJ, Belfiore LA, Tang J. *Microchemical Journal* (2026) 220: 116300 [Impact Factor 4.7](#)

**88. Enhanced Efficiency of Blade-Coated Polymer Solar Cells via Eu<sup>3+</sup>/Tb<sup>3+</sup>-Induced Nanoaggregates of PS-b-PAA**

Li S, Shen W, Guo S, Yue Y, Wang Y, Fu H, Wang Q, Kipper MJ, Snow CD, Lee SW, Belfiore LA, Tang J. *Sci. Adv. Mater. Dev.* (2026) 11(1): 101066 [Impact Factor 7.7](#)

## **Submitted**

### **Bioluminescent Trace Labeling of Porous Protein Microcrystals for Evaluating Pharmacodynamics**

Jones AA, O'Brian A\*, Lewis I\*, Beatty L\*, Frueh L\*, Henry M\*\*, Shepherd C\*, Ahr T\*, Kelly B\*, Snow CD, Horak KE (2026). *Journal of Biomedical Materials Research Part A*

## **Imminent Submission**

### **Modular Scaffold Crystals for Programmable Installation and Structural Observation of DNA-Binding Proteins**

Shields ET, Slaughter CK, Mekkaoui F, Magna EN, Shepherd C\*, Lukeman PS, Spratt DE, Snow CD. Will submit first to *Science*

## **Near-Term Submission**

### **Protein Engineering within the CC1+10 Lattice: Structural Tolerance and Functional Expansion**

Shields ET, Slaughter CK, Magna EN, Snow CD.

### **Crystalline Biomaterials for Site-Specific Organization of Modified DNA**

Slaughter CK, Magna EN, Shields ET, Snow CD

## **Preparing for Resubmission**

### **Evaluating Porous Protein Microcrystals as a Delivery Scaffold for Nucleic Acids**

Jones AA, Masri M, Horak KE, Snow CD

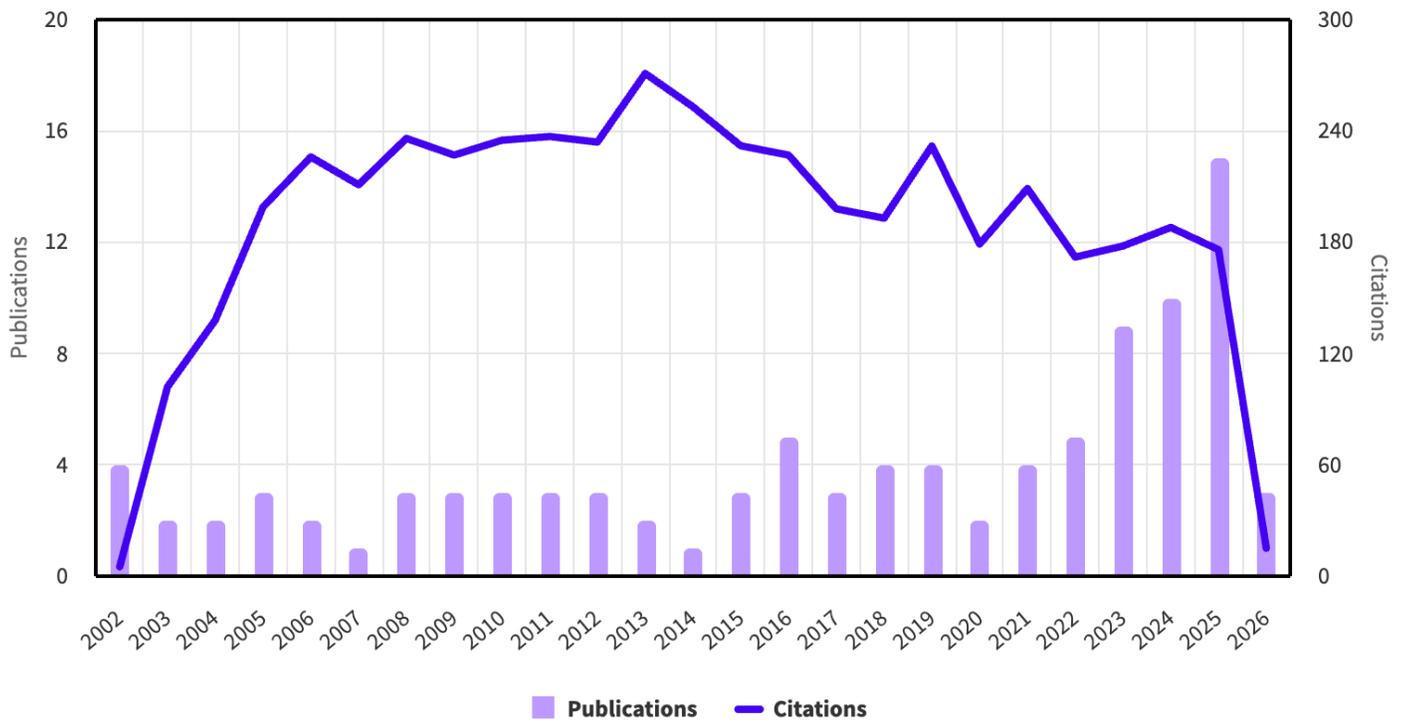
### **Protein Crystals as Molds for Seeded Gold Nanorod Growth**

AE Kowalski, R Nemeth, S Zintgraff\*, S Sloan\*, TR Huber, P Ciesielski, CJ Ackerson, CD Snow

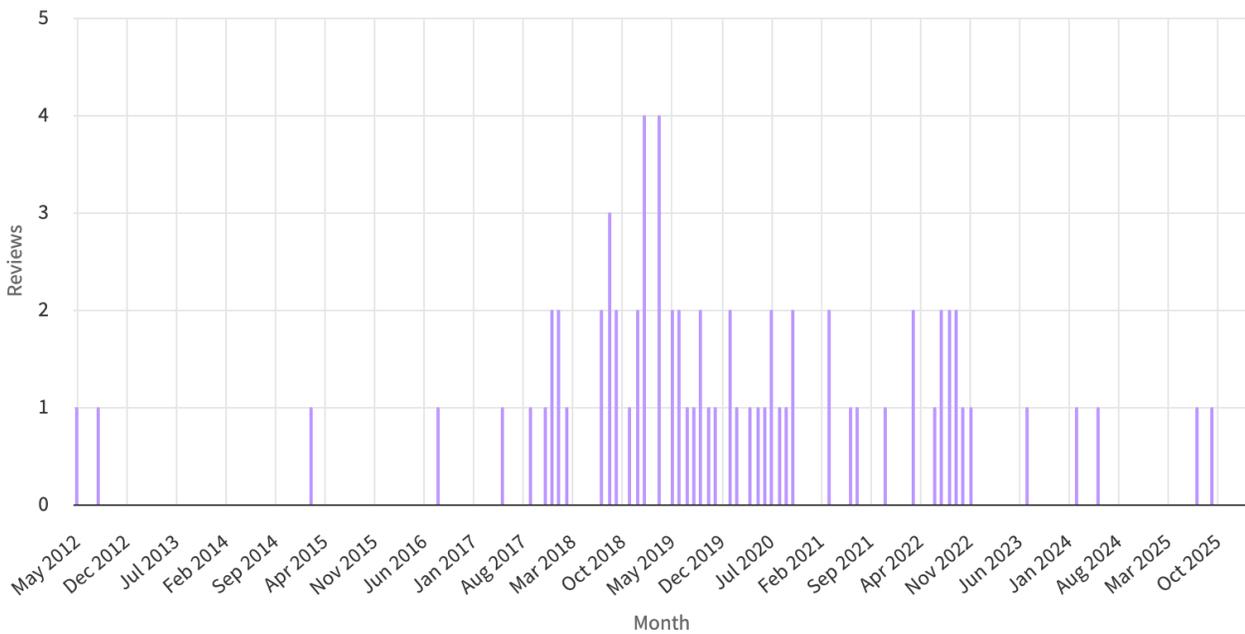
**Key:** \*Undergraduate author, \*\*Pre-collegiate author

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

## Times Cited and Publications Over Time



## Reviews



## **Selected Conference Abstracts, Posters, and Oral 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. *National Meet. Amer. Chem. Soc.* (2002).

**2. Directly calculated ligand binding free energies using Folding@Home.**

MR Shirts, G Jayachandran, CD Snow, et al. *National Meet. Amer. Chem. Soc.* Philadelphia (2004)

**3. Directly calculated ligand binding free energies using Folding@Home.**

MR Shirts, CD Snow, VS Pande. *National Meet. Amer. Chem. Soc.* Anaheim. (2004)

**4. Exploring the kinetics and mechanism of millisecond protein folding with molecular dynamics.**

CD Snow, VS Pande. *18<sup>th</sup> 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. *18<sup>th</sup> 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 Meet. Amer. Chem. Soc.* 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 Meet. Amer. Chem. Soc.* San Diego. 2005.

**8. Binding energy calculation for theophylline-RNA aptamer with generalized bar method.**

Y Tanida, M Ito, H Fujitani, et al. *National Meet. Amer. Chem. Soc.* San Diego. 2005.

**9. Quantifying the conformational space of FKBP ligand binding.**

MR Shirts, CD Snow, G Jayachandran et al. *National Meet. Amer. Chem. Soc.* 2006.

**10. Explicit and implicit solvation binding free energies of FKBP-12.**

MR Shirts, G Jayachandran, CD Snow et al; *National Meet. Amer. Chem. Soc.* 2007.

**11. SCHEMA recombination reveals structural characteristics of active variants of Hypocrea jecorina Cel5a.**

M Farrow, TM Lee, CD Snow et al; *National Meet. Amer. Chem. Soc.* Denver. 2011

**12. SCHEMA structure-guided recombination in engineering cellulase families for biomass-to-biofuel conversion processes**

P Heintelman, CD Snow, R Komor, I Wu, M Smith, P Romero, FH Arnold; *National Meet. Amer. Chem. Soc.* Anaheim. 2011.

**13. Focused library design via combinatorial optimization of degenerate codons.**

CD Snow; *National Meet. Amer. Chem. Soc.* Anaheim. 2011.

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

**15. GPU-accelerated algorithms for sampling protein crystal forms.**

CD Snow; *27<sup>th</sup> Symp. 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; *28<sup>th</sup> 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; *28<sup>th</sup> 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; *249<sup>th</sup> ACS National Meeting.* Denver (2015)

**19. Engineering Porous Protein Crystals as Scaffolds for Programmed Assembly**

TR Huber, LF Hartje, CD Snow; *29<sup>th</sup> 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<sup>th</sup> 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. Synthesis of Nanostructures Inside Crystalline Protein Scaffolds.**

CD Snow; *NSF Nanoscale Science and Engineering Grantees Conference*. Arlington (2016)

**23. Characterizing Large-Pore Protein Crystals for Advanced Material Applications**

LF Hartje, BE Munsy, HT Bui, DA Andales, CD Snow; *62<sup>nd</sup> Ann. Meet. Biophys. Soc.* (2018)

**24. Synthetic Biology and the Nasal Microbiome**

CD Snow, CAM Peebles; *1<sup>st</sup> Ann. Meet. Front Range Microbiome Symposium*. Fort Collins (2019)

**25. Textile functionalization by porous protein crystal conjugation and guest molecule loading**

LF Hartje, D Andales, L Gintner, L Johnson, L Yan, CD Snow; *257<sup>th</sup> ACS National Meeting*. Orlando (2019).

**26. Modular and Expandable Protein-DNA Co-crystal Scaffolds to Assist in X-ray Diffraction of DNA-Binding Macromolecules**

A Ward, CD Snow; *33<sup>rd</sup> Symp. of the Protein Society*. (2019)

**27. 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<sup>th</sup> Symp. of the Protein Society*. (2021)

**28. Chemical DNA ligation templated by a DNA-binding protein scaffold**

S Dmytriw, A Vajapayajula, A Ward, CD Snow; *35<sup>th</sup> Symp. of the Protein Society*. (2021)

**29. Development of porous protein nanocrystals as a delivery vector for DNA and RNA**

A Jones, M Masri, CD Snow; *35<sup>th</sup> Symp. of the Protein Society*. (2021)

**30. Quantifying Protective Effects of Engineered Porous Protein Crystals on Adsorbed Guest RNA**

M Masri, CD Snow, A Jones; *35<sup>th</sup> Symp. of the Protein Society*. (2021)

**31. Porous Protein Crystal Scaffolds for Peroxidase Pixel Detectors**

L Beatty, A Jones, CD Snow; *35<sup>th</sup> Symp. of the Protein Society*. (2021)

**32. Measuring Interactions of Polymers with Porous Protein Crystals by Atomic Force Microscopy and Tuning Cell Responses via Ligand Presentation**

D Wang, M Hedayati, JD Stuart, KC Popat, CD Snow, MJ Kipper; *BMES* (2022)

**33. Development of porous protein nanocrystals as a delivery vector for DNA and RNA**

A Jones, M Masri, CD Snow; *36<sup>th</sup> Symp. of the Protein Society*. (2022) **Poster Award**

**34. Engineering a protein crystal scaffold for modular installation of enzymes**

B Kelly\*, L Beatty\*, A Jones, CD Snow; *36<sup>th</sup> Symp. of the Protein Society*. (2022)

**35. Computational Optimization of a FLAG-binding Single-Chain Variable Fragment**

J De Roo, CD Snow; *36<sup>th</sup> Symp. of the Protein Society*. (2022) **Selected for Flash Talk**

**36. In Silico Prediction of Linear Antibody-Epitopes via AlphaFold2**

J DeRoo, ST James, CD Snow, B Geiss; *37<sup>th</sup> Symp. of the Protein Society*. (2023) **Poster Award**

**37. Stabilization of the Protein-Protein Interface in Protein-DNA Co-Crystals**

C Shepherd\*, E Shields, C Slaughter, CD Snow; *37<sup>th</sup> Symp. of the Prot. Soc.* (2023) **Poster Award**

**38. Stabilization of the Protein-Protein Interface in Protein-DNA Co-Crystals**

C Shepherd, E Shields, C Slaughter, CD Snow; *Rocky Mountain Regional ACS Meeting*. (2023)

**39. Wastewater viral surveillance using modified porous protein microcrystals**

A Jones, B Kelly\*, T Ahr, CD Snow; *37<sup>th</sup> Symp. of the Protein Society*. (2023)

**40. Adsorption of DNA-Binding Proteins via Engineered Host DNA Crystals**

C Slaughter, [CD Snow](#); *37<sup>th</sup> Symp. of the Protein Society*. (2023)

**41. Optimizing Protein Crystal Stability Using a Network of Disulfide Bonds**

A O'Brian\*, [CD Snow](#); *37<sup>th</sup> Symp. of the Protein Society*. (2023)

**42. Improved Protein Crystal Production via Microfluidic Flow Cells**

T Ahr\*, [CD Snow](#); *37<sup>th</sup> Symp. of the Protein Society*. (2023)

**43. Expanded Co-Crystals as Scaffolds for DNA-binding Protein Guests**

E Shields, [CD Snow](#); *37<sup>th</sup> Symp. of the Protein Society*. (2023)

**44. The Building of Protein-DNA Scaffold Co-Crystals**

C Shepherd\*, ET Shields, [CD Snow](#); *Ann. Meeting Amer. Soc. for Biochem. & Mol. Biol.* (2023)

**45. Development of a Sampling Device Containing a Crystal Scaffold for Continuous Capture of SARS-CoV-2 Virions from Water**

AA Jones, MS Barlak, C Wilusz, S De Long, J Mizia, [CD Snow](#); *CSU Hydrology Days*. (2024)

**46. A Machine Learning Approach to Designing Avidity-Based Sensors for Ubiquitin modified Nucleosomes**

J Leavitt, CD Passos, RE Cohen, CD Snow, TT Yao; *38<sup>th</sup> Symp. Of the Protein Society*. (2024)

**47. Characterization of guest DNA transport and adsorption within host porous protein crystals**

SH Chen, J Stuart, B Munsky, CD Snow; *69<sup>th</sup> Ann. Meet. Biophys. Soc.* (2025)

**48. Biomolecular Co-Crystals for Capture, Storage, and Release of Nucleic Acids**

CK Slaughter, CD Snow; *69<sup>th</sup> Ann. Meet. Biophys. Soc.* (2025)

**49. Optimizing Biomolecular Microcrystals for In Vitro Cell Delivery**

XLS Paredes\*, CD Snow; *69<sup>th</sup> Ann. Meet. Biophys. Soc.* (2025)

**50. Computational Protein Design for a Novel Porous DNA-Protein Co-Crystal**

EM Magna, CD Snow; *39<sup>th</sup> Symp. Of the Protein Society*. (2025)

**51. Next Generation Clonable Nanoparticles for Electron Microscopy**

R Cohen, CD Snow, CJ Ackerson; *39<sup>th</sup> Symp. Of the Protein Society*. (2025)

**52. Biomolecular Co-Crystals as Scaffolds for DNA Binding Proteins**

ET Shields; *39<sup>th</sup> Symp. Of the Protein Society*. (2025)

## **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, "Isorecticular 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. Provisional Patent Application No. 18/734,755, "POROUS PROTEIN MICROCRYSTALS AS A SCAFFOLD FOR NUCLEIC ACIDS AND PROTEINS", assigned to Colorado State University System and the USDA.

[United States Patent Application 20230399637](#). "CROSSLINKED POROUS PROTEIN CRYSTALS WITH GUEST BARCODE DNA"

[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 – 8-31-2014. Snow (PI)

### SBIR Phase II: Real-Time Biosensor for Measuring Hazardous Chemical Contaminants in Ground Water

*National Science Foundation* IIP 1431003 Subcontract \$28,971  
8-1-2014 – 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 – 8-31-2017. Snow (PI)

### Programmed Assembly of Conductive Protein Crystals

*National Science Foundation.* DMR 1506219 \$357,437  
9-1-2015 – 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 – 2-28-2018. Snow (PI)

### Tuning Interfacial Biomolecule Interactions with Massively Parallel Nanopore Arrays

*National Science Foundation.* CBET BEINM, \$439,341  
7-15-2017 – 6-30-2020. Snow (Co-PI)

### Innovative Platforms for In Vivo Molecular Tagging and Editing

*Colorado State University* OVPR \$200,000  
1-1-2018 – 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 – 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 – 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 – 9-29-2022 Snow (PI)

### Nasal Microbiome Engineering for Enhanced Olfaction

*DOD, Office of Naval Research* GRANT12762737 \$749,898  
3-1-2019 – 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 – 6-30-2020 Vemuri (PI), Snow (subcontract PI)

**Surveillance of mosquito and arbovirus dispersal using smart microcrystals**  
*National Institutes of Health* NIH NIAID R21A146740 \$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 obtained several PRC grants to support visits from foreign experts, provided a per diem during visits, and otherwise supported foreign expert advising of Qingdao University graduate students. The last in-person visit was in April of 2024. No future trips are planned.

**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 – 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 – 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 – 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 – 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 – 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 – 3-31-2024 Ackerson (PI), Snow (Co-I)

<b>Designed Expanded Co-Crystals for Guest Structure Determination</b> <i>National Science Foundation</i> 09/01/2020 – 08/31/2023	NSF DMR BMAT 2003748 Snow (PI)	\$422,890
<b>Scott Bioengineering Systems and Synthetic Biology (SSB) Pod Molecular Biology Expansion</b> <i>Colorado State University</i> 2-1-2021 – 6-30-2021	OVPR Snow (Co-PI)	\$25,000
<b>MURALS First Year Scholar Pilot Program</b> <i>Colorado State University</i> 8-1-2021 – 12-31-2021	Office of the Provost Snow (PI)	\$2,000
<b>Multiplexed imaging of viral protein processing and assembly in live cells</b> <i>National Institutes of Health</i> 8-6-2021 – 7-31-2022	NIH NIAID R56 AI155897-01A1 Snow (PI), Stasevich (PI), Geiss (Co-I)	\$517,692
<b>Multiplexed imaging of viral protein processing and assembly in live cells</b> <i>National Institutes of Health</i> 9-21-2022 – 7-31-2027	NIH NIAID R01AI168459-01A1 Snow (PI), Stasevich (Co-I), Geiss (Co-I)	\$2,278,589
<b>COVID-19: Defining the Translocation Mechanisms of SARS-CoV-2 nsp13 Helicase to Aid in Antiviral Development</b> <i>National Institutes of Health</i> 8/2021 – 7/2026	NIH NIAID 1 R01 AI166050-01 (PIs: McCullagh, Geiss, Co-I Snow)	\$2,229,089
<b>Transformative pandemic response infrastructure: an integrated device for automated wastewater sampling and simultaneous molecular capture of infectious agents</b> <i>Anschutz Foundation</i> 10/2021 – 5/2025	De Long (PI), Wilusz (co-PI), Snow (co-PI)	\$233,795
<b>Tracking mosquito movements from birth to bite</b> <i>CSU One Health Institute</i> 05/2021 – 08/2021	(PI: VandeWoude)	\$4,800
<b>SBIR Phase II: Sustainable production of high-performance dietary supplements</b> <i>National Science Foundation</i> 8-1-2022 – 7-31-2024	SBIR 2139470 / Sasya LLC Vemuri (PI), Snow (subcontract PI)	\$995,239
<b>Sustainable production of high-performance dietary supplements</b> <i>Foundation for Food &amp; Agricultural Research</i> 5-1-2023 – 4-30-2025	Sasya LLC Vemuri (PI), Snow (subcontract PI)	\$158,657
<b>Developing DNA-Capture Protein Crystals for Enhanced Detection of ctDNA from Urine.</b> <i>Colorado Clinical and Translational Sciences Institute</i> 8-1-2024 – 7-31-2025	Snow (PI), Henry (Co-PI)	\$30,000
<b>Self-assembly and dynamic reconstruction of expanded biomolecular co-crystals</b> <i>National Science Foundation</i> 9-1-2023 – 8-31-2026	Snow (PI)	\$436,772

**ROA: Self-assembly and dynamic reconstruction of expanded biomolecular co-crystals**

National Science Foundation Supplement to Support Visiting Professor \$40,508  
1-1-2026 – 8-31-2026 Snow (PI)

**Bioimaging Using Luminescent Lanthanide Complexes (LLC)**

Walter Scott Jr. Foundation \$50,000  
1-1-2024 – 6-30-2024 Kipper (PI), Snow (Co-PI)

**Sustainable Carbon Capture via Molecular Engineering of Tough Biological Materials**

CSU Thematic Excellence Unit: Carbon Management \$33,000  
5-1-2024 – 5-31-2025 Conant (PI), Snow (sub-seed project)

**Sustainable Carbon Capture via Molecular Engineering of Tough Biological Materials**

CSU School of Global Environmental Sustainability \$10,000  
8-1-2024 – 5-31-2025 Snow (PI)

**Machine-Learning Aided Design of Avidity-Based Biosensors of Ubiquitin Signaling**

National Institutes of Health \$2,730,252  
4-1-2024 – 3-31-2029 Snow (Co-PI)

**Clonable Nanoparticles**

National Institutes of Health NIH NIGMS 2R01GM137139-O5A1 \$2,261,421  
2-1-2025 to 3-31-2029 Ackerson (PI), Snow (Co-I), Tsunoda (Co-I)

**Odor Encoder: AI-in-the-loop Design, Testing, and Directed Evolution of Olfactory Biosensors**

Walter Scott Jr. Foundation \$133,606  
2-1-2026 – 8-30-2027 Snow (PI), Peebles (Co-PI)

**INVITED TALKS (Selected)**

- American Crystallography Association. *Lombard, IL* 2025
- South Dakota School of Mines. *Rapid City, SD* 2025
- Keystone Symposium: Machine Learning Applied to Macromolecular Structure and Function 2025
- University of Wyoming: Seminar and Molecular Visualization Workshop. *Laramie WY* 2024
- Qingdao University. *Virtual* 2024
- Society for Biomaterials Western Region Symposium, *Aurora, CO* 2024
- Colorado School of Mines. *Golden, CO* 2024
- ACS meeting. *Laramie, WY* 2023
- NIH training program keynote. *Fort Collins, CO* 2023
- Qingdao University. *Qingdao* 2023
- GoogleX, *Virtual* 2022
- Tolmar, *Virtual* 2022
- Translational Medicine Institute, *Fort Collins, CO* 2022

- Denver University. *Denver, CO* 2022
- Brigham Young University, *Virtual. Salt Lake City, UT* 2021
- The 5<sup>th</sup> International Conference on Molecular Simulation, *Jeju, Korea* 2019
- KAIST, *Daejeon, Korea* 2019
- Tokyo Institute of Technology, *Tokyo, Japan* 2019
- Kansas University. *Lawrence KS* 2019
- 257th ACS National Meeting. *Orlando, FL* 2019
- Hybrid Materials Symposium: *Qingdao University, China* 2017
- NSF Nanoscale Science and Engineering Grantees Conference, *Arlington VA* 2016
- Dartmouth, *Hanover NH* 2016
- UNC, *Chapel Hill NC* 2016
- Colorado School of Mines, *Golden, CO* 2015
- United States Army Natick Soldier Research, Development, and Engineering, *Natick, MA* 2015
- Protein Society Topical Panel Discussion, *Barcelona, Spain* 2015
- Protein Society Topical Panel Discussion, *Boston, MA* 2013
- Kansas State University, *Manhattan, KS* 2013
- UC Boulder Seminar Series, *Boulder, CO* 2012
- National Renewable Energy Laboratory, *Golden, CO* 2012
- Society for Industrial Microbiology – Biocatalysts By Design, *New Orleans, LA* 2011
- American Chemical Society – Emerging Topics in Protein Engineering, *Anaheim, CA* 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

- CBE310:** Molecular Concepts and Applications (each year 2017 – 2025)  
**CBE201:** Material and Energy Balances (each year 2012– 2017)\  
**CBE570:** Biomolecular Engineering & Synthetic Biology (most years 2013 – 2026)  
**BIOM570:** Bioengineering. (guest lectures most years 2011-2025)  
**AGRI601:** Bioenergy Technology. (guest lectures 2012, 2013, 2014)

## 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, 2023 – 2024  
**BIOMOD Student Organization Advisor:** 2017 – 2025  
**Protein Society Abstracts Chair:** 2021 – 2025

## 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
- External Sabbatical Review, Oct 2018
- CCTSI Proposal Review, Nov 2019
- Israel Science Foundation Proposal Review, Feb 2020
- NSF Proposal Review, Feb 2021
- NSF Proposal Review, Apr 2021
- Tenure Review, Sep 2021
- NIH Study Section, Feb 2023
- NIH Study Section, Apr 2025
- NIH Study Section, Jan 2026

## Major Advisor for the Following Students:

- Ph.D. program, Szu-Hsuan Chen, Sixth-Year, Chem. Bio. Engr.  
Area of Study: Host-guest crystal transport modeling
- Ph.D. program, Rachel Cohen, Fifth-Year, Chemistry  
Area of Study: Enzyme engineering
- Ph.D. program, Callie Slaughter, Fifth Year, Cell & Molecular Biology Program  
Area of Study: Co-crystals, DNA barcodes
- Ph.D. program, Emma Magna, Fourth Year, Cell & Molecular Biology Program  
Area of Study: Co-crystals engineering
- Ph.D. program, John League, Third-Year, Chemistry  
Area of Study: Protein crystal production optimization
- Ph.D. program, Aech Loar, Second-Year, Chemistry  
Area of Study: Design of Covalent Protein Materials
- Ph.D. program, Pegah Eizadkhah, Second-Year, Cell & Molecular Biology Program  
Area of Study: Computational Protein Design
- Ph.D. program, Kimberly Robins, Second-Year, Microbiology, Immunology, & Pathology  
Area of Study: Computational Protein Design

## Transitional Group Personnel

- Ph.D. program, Alec Jones, *Bioengineering*  
Area of Study: Protein Crystal Sensors, RNA Delivery  
Successful Thesis Defense, Finalizing Written Dissertation
- Ph.D. program, Ethan Shields, *Bioengineering*  
Area of Study: Co-crystal Engineering  
Successful Thesis Defense, Finalizing Written Dissertation

## Group Alumni

- Ph.D. program, Jacob DeRoo, *Bioengineering*  
Thesis (2024) Interdisciplinary techniques in protein binding prediction and crystal engineering
- M.S. program, Brielle Patlin, *Biochemistry & Molecular Biology* [Joint Advisor]  
Thesis (2023) Sex dependent regulation of immune responses in ex vivo lung slices
- Ph.D. program, Julius Stuart, *Chemistry*  
Thesis (2022) Characterization and application of a novel composite nanomaterial comprised of porous protein crystals and synthetic DNA.
- Ph.D. program, Abigail Orun, *Chemistry*  
Thesis (2022) Engineered co-crystals as scaffolds for structural biology.
- M.S. program, Mahmoud Masri, *Chem. Bio. Engr.*  
Thesis (2022) Porous protein microcrystals as a scaffold for nucleic acids and proteins
- M.S. program, Michael Scroggins, *Bioengineering*  
Thesis (2022) Odor encoder: computational design of a novel allosteric enzyme activation system for providing enhanced olfactory abilities to trained odor detecting sentinel animals.
- Ph.D. program, Dafu Wang, *School of Advanced Materials Discovery* [Joint Advisor]  
Thesis (2021) Tuning interfacial biomolecule interactions with massively parallel nanopore arrays
- Ph.D. program, Angeline Ta, *Chemistry* [Late Stage Advisor]  
Thesis (2018): Protein Engineering for Therapeutic Strategies and Tools
- Ph.D. program, Ann Kowalski, *Chem. Bio. Engr.*  
Thesis (2018): Protein Crystals as Nanotemplating Materials
- Ph.D. program, Luke Hartje, *Biochemistry & Molecular Biology*  
Thesis (2018): Characterizing Porous Protein Crystal Materials for Applications in Nanomedicine and Nanobiotechnology
- Ph.D. program, Thaddaus Huber, *Chem. Bio. Engr.*  
Thesis (2017): Towards Macromolecular Scaffold Assisted Crystallography
- Ph.D. program, Lucas Johnson, *Chem. Bio. Engr.*  
Thesis (2016): Engineering Stabilized Enzymes
- M.S. program, Mark Lunt, *Chem. Bio. Engr.*  
Thesis (2015): Software for the Use of Protein Fragment Recombination and Regression in Protein Structure Determination and Design
- M.S. program, Jacob Sebesta, *Chem. Bio. Engr.*  
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](http://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 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). Since 2017, he supports the BIOMOD student organization, a semi-autonomous student group dedicated to creative biomolecular engineering projects at CSU. Since its inception in 2021, he has supported teams of MURALS first year scholars, a program that brings 1<sup>st</sup>-year undergraduates from under-represented backgrounds into research groups.

**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). From 2019 to 2023, Dr. Snow was 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 was Associate Senior Editor for the journal *Protein Engineering, Design, and Selection* from 2022-2023.