H. Christopher Fry

Scientist

Nanophotonics and Biofunctional Structures

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Education

Ph.D., Bioinorganic Chemistry, Johns Hopkins University (2005)
B. A., Chemistry, Kenyon College, Gambier, OH

Awards and honors

Sarah and Adolph Roseman Achievement Award (May 2003)
ACS Award for Undergraduate Research (May 1999)

Research interests

- Design and synthesis of novel supra-biomolecular materials for light harvesting, catalysis, and nanoparticle interfacing including biomineralization.
- Expertise in peptide synthesis, design, purification (chromatography), and characterization, organic/macrocycle synthesis, transient absorption spectroscopy, SEM, AFM, and electrochemistry.

Professional Experience

Argonne National Laboratory - Center for Nanoscale Materials (CNM)
Scientist *2014-present*
Assistant Scientist *2009-2014*

- Design and synthesis of novel supra-biomolecular materials for light harvesting, catalysis, and nanoparticle interfacing including biomineralization.
- Scientific contact for CNM user projects performing training, supervision, and guidance to CNM users on peptide synthesis, characterization, macrocycle synthesis, nanoparticle biomineralization, biomolecule-nanoparticle interfacing, chiral assemblies and characterization.
- Mentoring at all levels: Post-Doctoral, Undergraduate, and high school.

Northwestern University – Department of Chemistry
Post-Doctoral Researcher *2008-2009*

- Design of supramolecular light harvesting molecules (e.g. oligothiophenes and phthalocyanines).
- Multi-step organic synthesis, chromatography, NMR, UV/vis, infrared and circular dichroism spectroscopies.

University of Pennsylvania – Department of Chemistry
Post-Doctoral Researcher *2005-2008*

- Design of peptides and proteins for the incorporation of non-native, molecular cofactors.
- Photophysical characterization (e.g. transient absorption) of protein-chromophore complexes.
- Organic synthesis, solid-phase peptide synthesis, bacterial protein expression, chromatography.
- Transient absorption, NMR, circular dichroism, UV/vis, infrared spectroscopies.

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Selected Publications

Selected publications:

1. Silveira, G. D.; Chen, Z. W.; Barry, E. F.; Diroll, B. T.; Lee, B.; Rajh, T.; Rozhkova, E. A.; Laible, P. D.; **Fry, H. C.***, Energy transfer induced by confinement in a hybrid nanoparticle-membrane reversible assembly. **2019,** *Submitted for publication*.
2. **Fry, H. C.***; Silveira, G. D.; Cohn, H. M.; Lee, B., Diverse Bilayer Morphologies Achieved Via α-helix to β-sheet Transitions in a Short Amphiphilic Peptide. *Langmuir* **2019,** *Under Revision*.
3. Solomon, L. A.; Wood, A. R.; Sykes, M. E.; Diroll, B. T.; Wiederrecht, G. P.; Schaller, R. D.; **Fry, H. C.***, Microenvironment control of porphyrin binding, organization, and function in peptide nanofiber assemblies. *Nanoscale* **2019,** *11*, 5412-5421.
4. Kim, Y. J.*; Schaller, R. D.; **Fry, H. C.**, Control of Shell Morphology in p-n Heterostructured Water-Processable Semiconductor Colloids: Toward Extremely Efficient Charge Separation. *Small* **2019,** *15* (2).
5. Chen, Z. W.; Silveira, G. D.; Ma, X. D.; Xie, Y. S.; Wu, Y. M. A.; Barry, E.; Rajh, T.; **Fry, H. C.**; Laible, P. D.; Rozhkova, E. A.*, Light-Gated Synthetic Protocells for Plasmon-Enhanced Chemiosmotic Gradient Generation and ATP Synthesis. *Angew. Chem.-Int. Edit.* **2019,** *58* (15), 4896-4900.
6. Wang, Y.; **Fry, H. C.**; Skinner, G. E.; Schill, K. M.; Duncan, T. V.*, Detection and Quantification of Biologically Active Botulinum Neurotoxin Serotypes A and B Using a Forster Resonance Energy Transfer-Based Quantum Dot Nanobiosensor. *ACS Appl. Mater. Interfaces* **2017,** *9* (37), 31446-31457.
7. Solomon, L. A.; Sykes, M. E.; Wu, Y. M. A.; Schaller, R. D.; Wiederrecht, G. P.; **Fry, H. C.***, Tailorable Exciton Transport in Doped Peptide-Amphiphile Assemblies. *ACS Nano* **2017,** *11* (9), 9112-9118.
8. Solomon, L. A.; Kronenberg, J. B.; **Fry, H. C.***, Control of Heme Coordination and Catalytic Activity by Conformational Changes in Peptide-Amphiphile Assemblies. *J. Am. Chem. Soc.* **2017,** *139* (25), 8497-8507.
9. **Fry, H. C.***; Wood, A. R.; Solomon, L. A., Supramolecular control of heme binding and electronic states in multi-heme peptide assemblies. *Org. Biomol. Chem.* **2017,** *15* (32), 6725-6730.
10. Polizzi, N. F.; Eibling, M. J.; Perez-Aguilar, J. M.; Rawson, J.; Lanci, C. J.; **Fry, H. C.**; Beratan, D. N.; Saven, J. G.; Therien, M. J., Photoinduced Electron Transfer Elicits a Change in the Static Dielectric Constant of a de Novo Designed Protein. *J. Am. Chem. Soc.* **2016,** *138* (7), 2130-2133.
11. Deshmukh, S. A.; Solomon, L. A.; Kamath, G.; **Fry, H. C.***; Sankaranarayanan, S.*, Water ordering controls the dynamic equilibrium of micelle-fibre formation in self-assembly of peptide amphiphiles. *Nat. Commun.* **2016,** *7*.
12. Zhang, C.; Song, C.; **Fry, H. C.**; Rosi, N. L.*, Peptide Conjugates for Directing the Morphology and Assembly of 1D Nanoparticle Superstructures. *Chem.-Eur. J.* **2014,** *20* (4), 941-945.
13. **Fry, H. C.***; Liu, Y.; Dimitrijevic, N. M.; Rajh, T., Photoinitiated charge separation in a hybrid titanium dioxide metalloporphyrin peptide material. *Nat. Commun.* **2014,** *5*.
14. Song, C. Y.; Blaber, M. G.; Zhao, G. P.; Zhang, P. J.; **Fry, H. C.**; Schatz, G. C.; Rosi, N. L.*, Tailorable Plasmonic Circular Dichroism Properties of Helical Nanoparticle Superstructures. *Nano Lett.* **2013,** *13* (7), 3256-3261.
15. **Fry, H. C.**; Lehmann, A.; Sinks, L. E.; Asselberghs, I.; Tronin, A.; Krishnan, V.; Blasie, J. K.; Clays, K.; DeGrado, W. F.; Saven, J. G.; Therien, M. J.*, Computational de Novo Design and Characterization of

a Protein That Selectively Binds a Highly Hyperpolarizable Abiological Chromophore. *J. Am. Chem. Soc.* **2013,** *135* (37), 13914-13926.

16. Wang, M. H.; Wang, C.; Young, K. L.; Hao, L. L.; Medved, M.; Rajh, T.; **Fry, H. C.**; Zhu, L. Y.; Karczmar, G. S.; Watson, C.; Jiang, J. S.; Markovic, N. M.; Stamenkovic, V. R., Cross-linked Heterogeneous Nanoparticles as Bifunctional Probe. *Chem. Mat.* **2012,** *24* (13), 2423-2425.
17. Koo, J.; Park, J.; Tronin, A.; Zhang, R. L.; Krishnan, V.; Strzalka, J.; Kuzmenko, I.; **Fry, H. C.**; Therien, M. J.; Blasie, J. K., Acentric 2-D Ensembles of D-br-A Electron-Transfer Chromophores via Vectorial Orientation within Amphiphilic n-Helix Bundle Peptides for Photovoltaic Device Applications. *Langmuir* **2012,** *28* (6), 3227-3238.
18. **Fry, H. C.***; Garcia, J. M.; Medina, M. J.; Ricoy, U. M.; Gosztola, D. J.; Nikiforov, M. P.; Palmer, L. C.; Stupp, S. I., Self-Assembly of Highly Ordered Peptide Amphiphile Metalloporphyrin Arrays. *J. Am. Chem. Soc.* **2012,** *134* (36), 14646-14649.
19. Zhang, J.; Jin, S. Y.; **Fry, H. C.**; Peng, S.; Shevchenko, E.; Wiederrecht, G. P.; Rajh, T.*, Synthesis and Characterization of Wurtzite ZnTe Nanorods with Controllable Aspect Ratios. *J. Am. Chem. Soc.* **2011,** *133* (39), 15324-15327.
20. Hurst, S. J.; **Fry, H. C.**; Gosztola, D. J.; Rajh, T.*, Utilizing Chemical Raman Enhancement: A Route for Metal Oxide Support-Based Biodetection. *J. Phys. Chem. C* **2011,** *115* (3), 620-630.
21. Krishnan, V.; Tronin, A.; Strzalka, J.; **Fry, H. C.**; Therien, M. J.; Blasie, J. K., Control of the Orientational Order and Nonlinear Optical Response of the "Push-Pull" Chromophore RuPZn via Specific Incorporation into Densely Packed Monolayer Ensembles of an Amphiphilic Four-Helix Bundle Peptide: Characterization of the Peptide-Chromophore Complexes. *J. Am. Chem. Soc.* **2010,** *132* (32), 11083-11092.
22. Korendovych, I. V.; Senes, A.; Kim, Y. H.; Lear, J. D.; **Fry, H. C.**; Therien, M. J.; Blasie, J. K.; Walker, F. A.; DeGrado, W. F., De Novo Design and Molecular Assembly of a Transmembrane Diporphyrin-Binding Protein Complex. *J. Am. Chem. Soc.* **2010,** *132* (44), 15516-15518.
23. Gonella, G.; Dai, H. L.; **Fry, H. C.**; Therien, M. J.; Krishnan, V.; Tronin, A.; Blasie, J. K., Control of the Orientational Order and Nonlinear Optical Response of the "Push-Pull" Chromophore RuPZn via Specific Incorporation into Densely Packed Monolayer Ensembles of an Amphiphilic 4-Helix Bundle Peptide: Second Harmonic Generation at High Chromophore Densities. *J. Am. Chem. Soc.* **2010,** *132* (28), 9693-9700.
24. **Fry, H. C.**; Lehmann, A.; Saven, J. G.; DeGrado, W. F.; Therien, M. J., Computational Design and Elaboration of a de Novo Heterotetrameric alpha-Helical Protein That Selectively Binds an Emissive Abiological (Porphinato)zinc Chromophore. *J. Am. Chem. Soc.* **2010,** *132* (11), 3997-4005