H. Christopher Fry

Scientist

Nanophotonics and Biofunctional Structures

Center for Nanoscale Materials
Building 440, Room A122
Phone: 630-252-4376
Fax: 630-252-5739
E-mail: hfry@anl.gov

Argonne National Laboratory
9700 S Cass Ave., Argonne, IL 60439

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.

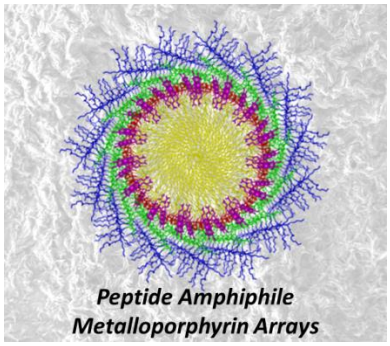
H. Christopher Fry

Selected Publications

Selected publications:

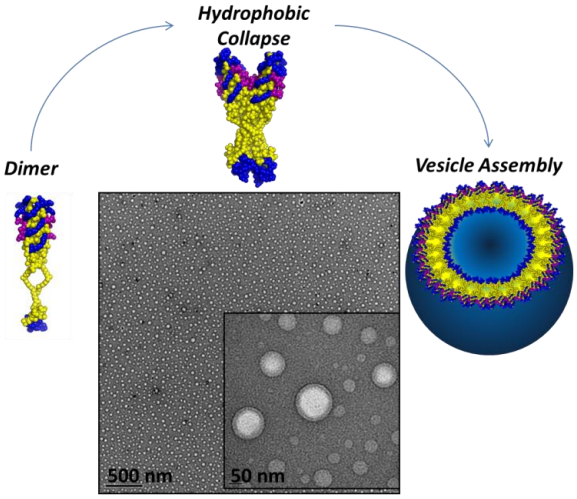
Peptide – Metalloporphyrin Interfaces

1. Solomon, L. A.; Kronenberg, J.; **Fry, H. C.** "Control of Heme Coordination and Catalytic Activity by Conformational Changes in Peptide-Amphiphile Assemblies" *Submitted for publication*
2. 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" *Journal of the American Chemical Society* **2016**, *138*, 2130.
3. **Fry, H. C.**; Liu, Y.; Dimitrijevic, N. M.; Rajh, T. "Photoinitated Charge Separation in a Hybrid TiO_2 Metalloporphyrin Peptide Material" *Nature Communications* **2014**, *5*, 4606.
4. **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" *Journal of the American Chemical Society* **2013**, *135*, 13914-13926.



5. **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" *Journal of the American Chemical Society* **2012**, *134*, 14646-14649.
6. Koo, J.; Park, J.; Tronin, A.; Zhang, R.; 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*, 3227-3238.
7. 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" *Journal of the American Chemical Society* **2010**, *132*, 11083-11092.
8. 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" *Journal of the American Chemical Society* **2010**, *132*, 15516-15518.
9. 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" *Journal of the American Chemical Society* **2010**, *132*, 9693-9700.
10. **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" *Journal of the American Chemical Society* **2010**, *132*, 3997-4005.
11. Tronin, A.; Strzalka, J.; Krishnan, V.; Kuzmenko, I.; **Fry, H. C.**; Therien, M.; Blasie, J. K. "Portable UV-visible spectrometer for measuring absorbance and dichroism of Langmuir monolayers at air-water interfaces" *Review of Scientific Instruments* **2009**, *80*.
12. McAllister, K. A.; Zou, H.; Cochran, F. V.; Bender, G. M.; Senes, A.; **Fry, H. C.**; Nanda, V.; Keenan, P. A.; Lear, J. D.; Saven, J. G.; Therien, M. J.; Blasie, J. K.; DeGrado, W. F. "Using alpha-helical coiled-coils to design nanostructured metalloporphyrin arrays" *Journal of the American Chemical Society* **2008**, *130*, 11921-11927.

13. Bender, G. M.; Lehmann, A.; Zou, H.; Cheng, H.; **Fry, H. C.**; Engel, D.; Therien, M. J.; Blasie, J. K.; Roder, H.; Saven, J. G.; DeGrado, W. F. "De novo design of a single-chain diphenylporphyrin metalloprotein" *Journal of the American Chemical Society* **2007**, *129*, 10732-10740.



Supramolecular Peptide Assembly

14. **Fry, H. C.;** Poluektova, M. O.; Demortiere, A.; Zhang, L.; Ren, G.Directed Self-Assembly of Multi Domain Peptides into Vesicle Constructs. *Manuscript in Preparation*.
15. Deshmukh, S. A.; Solomon, L. A.; Kamath, G.; **Fry, H. C.**; Sankaranarayanan, S. K. R. S. "Water Ordering Controls the Dynamic Equilibrium of Micelle-Fiber Formation in Self-Assembly of Peptide Amphiphiles" *Submitted for publication*.

User Publications

16. Zhang, C.; Song, C.; **Fry, H. C.**; Rosi, N. L. "Peptide Conjugates for Directing the Morphology and Assembly of 1D Nanoparticle Superstructures" *Chemistry-a European Journal* **2014**, *20*, 941-945.
17. Song, C.; Blaber, M. G.; Zhao, G.; Zhang, P.; **Fry, H. C.**; Schatz, G. C.; Rosi, N. L. "Tailorable Plasmonic Circular Dichroism Properties of Helical Nanoparticle Superstructures" *Nano Letters* **2013**, *13*, 3256-3261.
18. Wang, M.; Wang, C.; Young, K. L.; Hao, L.; Medved, M.; Rajh, T.; **Fry, H. C.**; Zhu, L.; Karczmar, G. S.; Watson, C.; Jiang, J. S.; Markovic, N. M.; Stamenkovic, V. R. "Cross-linked Heterogeneous Nanoparticles as Bifunctional Probe" *Chemistry of Materials* **2012**, *24*, 2423-2425.
19. Zhang, J.; Jin, S.; **Fry, H. C.**; Peng, S.; Shevchenko, E.; Wiederrecht, G. P.; Rajh, T. "Synthesis and Characterization of Wurtzite ZnTe Nanorods with Controllable Aspect Ratios" *Journal of the American Chemical Society* **2011**, *133*, 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" *Journal of Physical Chemistry C* **2011**, *115*, 620-630.

Ligand Metal Complex - Oxygen Activation

21. **Fry, H. C.**; Lucas, H. R.; Sarjeant, A. A. N.; Karlin, K. D.; Meyer, G. J. "Carbon monoxide coordination and reversible photodissociation in copper(I) pyridylalkylamine compounds" *Inorganic Chemistry* **2008**, *47*, 241-256.
22. Maiti, D.; **Fry, H. C.**; Woertink, J. S.; Vance, M. A.; Solomon, E. I.; Karlin, K. D. "A 1 : 1 copper-dioxygen adduct is an end-on bound superoxo copper(II) complex which undergoes oxygenation reactions with phenols" *Journal of the American Chemical Society* **2007**, *129*, 264-265.
23. **Fry, H. C.**; Cohen, A. D.; Toscano, J. P.; Meyer, G. J.; Karlin, K. D. "Photoinduced carbon monoxide migration in a synthetic heme-copper complex" *Journal of the American Chemical Society* **2005**, *127*, 6225-6230.
24. **Fry, H. C.**; Scaltrito, D. V.; Karlin, K. D.; Meyer, G. J. "The rate of O-2 and CO binding to a copper complex, determined by a "flash-and-trap" technique, exceeds that for hemes" *Journal of the American Chemical Society* **2003**, *125*, 11866-11871.