CURRICULUM VITAE

Stephen H. Frayne

113 Hurds Hill Road
Woodbury, CT 06798

(203)-592-8322
sfrayne@wesleyan.edu

EDUCATION

Wesleyan University, Middletown, CT **2012-2017**(expected)
Ph.D. Chemistry

Fordham University, Bronx, NY **2008-2012**
B.S. Chemistry (ACS certification)

AWARDS AND HONORS

Connecticut Valley Section-American Chemical Society Travel Grant **2017**
Funding to attend the 253rd ACS National Meeting, San Francisco, CA

Molecular Biophysics Training Program, Wesleyan University **2013-2014**
Graduate stipend and travel to the 58th Annual Biophysical Society Meeting was fully funded.

Certificate of Excellence for Outstanding Oral Presentation **2012**
Analytical Chemistry Division of 66th Annual Eastern College Science Conference, Wayne, NJ

Undergraduate Research Grant, Fordham University **2012**

Summer Science Internship, Fordham University **2011**

Travel Grant, Fordham University **2011**
Funding to attend the 241st ACS National Meeting, Anaheim, CA.

Travel Grant, Fordham University **2011**
Funding to attend the National Conferences on Undergraduate Research (NCUR), Ithaca, NY.

Micro Grant, Fordham University **2011**
Funding to subsidize travel costs to collaborative universities (CUNY Queens College).

Matteo Ricci Undergraduate Summer Scholarship, Fordham University. **2010**

RESEARCH EXPERIENCE

Wesleyan University, Department of Chemistry **2012-Present**
Graduate Researcher; Advisor: Brian H. Northrop, Ph.D.
Organic materials research on the synthesis of polymeric and dendritic macromolecules via thiol-ene "click" chemistry.

- Synthesis of various AB_2 branched monomer units comprised of a thiol focal point and furan-protected maleimide branches for "click" reactions with a myriad of maleimide-based core molecules.
- Sequential orthogonal synthesis of multifunctional polymers by selective thiol-ene reactions.
- Combined computational and experimental studies to design and understand selective thiol-ene and thiol-Michael reactions.

Fordham University, Department of Chemistry **2009-2012**
Undergraduate Researcher; Advisor: Ipsita A. Banerjee, Ph.D.

- Design and synthesis of nanoconjugates of gold nanoparticles with phytohoromone based assemblies.
- Synthesized CdSe and ZnS quantum dots and examined their photophysical properties in the presence of germania and titania based nanomaterials.
- Studied the interactions of phytohoromone-quantum dot assemblies with mammalian cells.

- Conducted encapsulation and drug release studies using the model drug diphenhydramine in the presence of poly(lactic-co-glycolic acid) based hydrogels.

PUBLICATIONS

8. Northrop, B. H.; **Frayne**, **S. H.**; Choudhary, U. Thiol-maleimide "click" chemistry: evaluating the influence of solvent, initiator, and thiol on the reaction mechanism, kinetics, and selectivity. *Polym. Chem.*, **2015**, *6*, 3415-3430.

- Themed collection: 2015's most accessed Polymer Chemistry articles – 20 Polymer Chemistry articles that received the most downloads in 2015.

7. Barnaby, S. N.; Nakatsuka, N.; **Frayne**, **S. H.**; Fath, K. R.; Banerjee, I. A. Formation of hyaluronic acid–ellagic acid microfiber hybrid hydrogels and their applications. *Colloid Polym. Sci.*, **2013**, *291*, 515-525.

6. **Frayne, S. H**.; Barnaby, S. N.; Nakatsuka, N.; Banerjee, I. A. Growth and properties of CdSe nanoparticles on ellagic acid biotemplates for photodegradation applications. *Mater. Express*, **2012,** *2*, 335-343.

5. Sarker, N. H.; Barnaby, S. N.; Fath, K. R.; **Frayne**, **S. H.**; Nakatsuka, N. Biomimetic growth of gallic acid-ZnO nanohybrid assemblies and their applications. *J. Nanopart. Res.* **2012**, *14*, 1-12.

4. **Frayne, S. H.**; Barnaby, S. N.; Tsiola, A.; Fath, K. R.; Smoak, E. M.; Banerjee., I. A. Growth of CdSe nanoparticles on abscisic acid nanofibers and their interactions with Hela cells, *Smart Nanomaterials for Sensor Application*s, Book Chapter, (*Ed. S. Li*), *Bentham Science Publications*, 1, (1), **2011**.

3. Barnaby, S. N.; **Frayne, S. H.**; Smoak, E. M.; Banerjee, I. A. Biomimetic fabrication of gold nanoparticles on templated indole-3-acetic acid based nanofibers. *Mater. Sci. Eng. C.* **2011**, *31*, 620-628.

2. Barnaby, S. N.; **Frayne, S. H.**; Fath, K. R.; Banerjee, I. A. Growth of Se nanoparticles on kinetin assemblies and their biocompatibility studies. *Soft Materials*. **2011**, *9*, 313-334.

1. Smoak, E. M.; **Frayne, S. H.**; Grant, V. C.; Banerjee, I. A. "Self-assembly and characterization of phytohormone conjugated gold nanoparticles" ***Polymer. Mater. Sci. Eng. Preprint***, published by the *American Chemical Society*, March **2010**.

ARTICLES IN PREPARATION

9. **Frayne, S. H.**; Abel, B. A.; McCormick, C. L.; Northrop, B. H. A computational and experimental investigation of nucleophile- and base-initiated thiol-Michael reactions. *To be submitted to Chem. Sci.*

10. **Frayne, S. H.**; Northrop, B. H. A Novel approach to dendrimer synthesis via thiol-maleimide click chemistry. *To be submitted to Macromolecules.*

11. **Frayne, S. H.**; Murthy, R.; Northrop, B. H. A Thorough Study and Demonstration of Catalyst/Initiator Driven Selectivity in the Thiol-Michael Reaction. *To be submitted to JOC.*

TEACHING EXPERIENCE

Wesleyan University, Graduate Pedagogy **2015**
Instructor
Selected interdepartmentally by faculty to teach this course required of all incoming graduate students. Independently developed and designed course syllabus and structure focusing on the best teaching practices.

Chemistry Tutor **2014-2016**
CHEM 251 – Principles of Organic Chemistry I
CHEM 252 – Principles of Organic Chemistry II

Wesleyan University, Department of Chemistry **2014-2015**
Head Teaching Assistant
CHEM 251 – Principles of Organic Chemistry I (Head TA)
CHEM 252 – Principles of Organic Chemistry II (Head TA)

Wesleyan University, Department of Chemistry **2012-2013**
Teaching Assistant
CHEM 257 – General Chemistry Laboratory
CHEM 258 – Organic Chemistry Laboratory

PRESENTATIONS

**denotes presenter*

Frayne*, S. H.; Murthy, R.; Northrop, B. H. "Computational and experimental investigations of the thiol-Michael click reaction and its applications in dendrimer synthesis" presented at the *253rd National Meeting and Exposition*, San Francisco, CA, April 2017.

Frayne*, S. H. "Designing dendritic macromolecules: from theory to experiment" invited talk presented at the *Graduate Speaker Series*, Wesleyan University, Middletown, CT, April 2016.

Frayne*, S. H; Northrop, B. H. **"**An experimental and computational study of the thiol-Michael click reaction, and its application to dendrimer synthesis" presented at the *44th National Organic Symposium*, College Park, MD, June 2015.

Frayne*, S. H.; Northrop, B. H. "High generation dendrimers via thiol-Michael click chemistry" presented at the *58th Annual Biophysical Society Meeting*, San Francisco, CA, February 2014.

Frayne*, S. H.; Fath, K. R.; Banerjee, I. A. "Development of nanoassemblies as drug carriers" presented at the *5th Annual FCRH Undergraduate Research Symposium*, Bronx, NY, April 2012.

Frayne*, S. H.; Sarker, N. H.; Barnaby, S. N.; Fath, K. R.; Banerjee, I. A. "Growth and functionalization of semiconductor nanoparticles on polyphenol templates" presented at the *Northeast Sigma Xi Research Conference*, Queens, NY, April 2012.

Frayne*, S. H.; Sarker, N. H.; Barnaby, S. N.; Nakatsuka, N.; Banerjee, I. A. Department of Chemistry, Fordham University. "Self-assembly of polyphenol based microfibrils and their applications from drug release to bioimaging" presented at the *66th Annual Eastern College Science Conference*, Wayne, NJ, April 2012.

Frayne*, S. H.; Sarker, N. H.; Barnaby, S. N.; Fath, K. R.; Banerjee, I. A. "Growth of quantum dots and metal nanoparticles on polyphenol templates and their applications" presented at the *6th Annual Columbia University Spring Undergraduate Research Symposium*, New York, NY April 2012.

Frayne*, S. H.; Dowdell, A. P.; Banerjee, I. A. "Abscisic acid nanostructures as templates for growth of germania-titiania nanocomposites" presented at the *59th Annual Undergraduate NY-ACS Research Symposium*, Riverdale, NY, May 2011.

Frayne*, S. H.; Barnaby, S. N.; Dowdell, A. P.; Banerjee, I. A. "Design of titania hybrids as solar cell materials on renewable templates" presented at the *4th Annual FCRH Undergraduate Research Symposium*, April 2011.

Dowdell, A. P.; **Frayne*, S. H.**; Banerjee, I. A. "Exploring the effects of shape controlled metal-oxide nanomaterials for the development of solar cells" presented at the *65th Annual Eastern Colleges Science Conference*, Fairfield, CT, April 2011.

Frayne*, S. H.; Barnaby, S. N.; Dowdell, A. P.; Banerjee, I. A. "Photosensitization of porphyrin derivatives in nanocrystalline GeO_2 for solar cell applications" presented at the *Annual National Conference on Undergraduate Research Conference*, Ithaca, NY, April 2011.

Frayne*, S. H.; Barnaby, S. N.; Dowdell, A. P.; Banerjee, I. A. "Investigation of photocatalytic behavior of poryphrin derivatives grown on germania-titania nanocomposites as potential solar cell materials" presented at the *241st American Chemical Society National Meeting and Exposition*, Anaheim, CA, March 2011.

Frayne*, S. H.; Smoak, E. M.; Banerjee, I. A. "Growth of germania based nanoshells on self-assembled phytohormones", presented at the *58th Annual Undergraduate NY-ACS Research Symposium*, Garden City, NY, May 2010.

Frayne*, S. H.; Smoak, E. M.; Banerjee. I. A. "Core shell hybrid nancomposites of abscisic acid for sensing", presented at the *64th Annual Eastern College Science Conference*, Pleasantville, NY, April 2010.

Smoak*, E. M.; **Frayne*, S. H.**; Fath, K. R.; Banerjee, I. A. "Development of self-assembled nanostructures from plant cytokinins and their applications in preparation of gold nanowires and drug delivery vehicles", presented at the *3rd Annual FCRH Undergraduate Research Symposium*, Bronx, NY, April 2010.

Smoak*, E. M.; **Frayne, S. H.**; Fath, K. R.; Banerjee, I. A. "Abscisic acid based hydrogels as drug delivery vectors", presented at the *4th Annual Columbia University Undergraduate Research Symposium*, March 2010.

Smoak*, E. M.; **Frayne, S. H.**; Grant, V. C.; Banerjee, I. A. "Self-assembly and characterization of phytohormone conjugated gold nanoparticles", presented at the *239th American Chemical Society National Meeting and Exposition*, San Francisco, CA, March 2010.

PROFESSIONAL SKILLS

General – Microsoft Office, Chemdraw. Experience in Adobe Photoshop and Adobe Illustrator.
Computational – Gaussian09, Kintecus.
Technical – Atomic Force Microscopy, Fluorescence Spectroscopy, Fourier Transform Infrared Spectroscopy, Ultraviolet-Visible Spectroscopy, Transmission Electron Microscopy, Scanning Electron Microscopy, Confocal Microscopy, Energy Dispersive X-Ray Spectroscopy, Dynamic Light Scattering, Zeta Potential Analysis, Differential Scanning Calorimetry, Circular Dichroism Spectroscopy, Thin Layer Chromatography, Nuclear Magnetic Resonance Spectroscopy, Gas-Chromatography Mass Spectrometry, Gel Permeation Chromatography, High Performance Liquid Chromatography.

ACADEMIC SERVICE

Graduate Judiciary Board (GJB) **2012-2015**

I served as one of five members on the graduate student association's graduate judiciary board tasked with overseeing violations of Wesleyan University's Honor Code and Code of Conduct. For the 2014-2015 academic year I was appointed chair of the GJB.

Fordham Undergraduate Research Journal (FURJ) **2010-2012**

I assembled the inaugural issue of FURJ, including drafting the author agreement, submission guidelines and generating templates to guide submitters in the humanities, social sciences and sciences. I personally oversaw

the peer review process of over thirty research articles and communications while managing a student and faculty staff of forty-five. The inaugural issue of FURJ featured high quality, peer-reviewed, original research as well as scholarly book reviews, review essays, and feature articles.

PROFESSIONAL AFFILIATIONS

American Chemical Society (ACS)	**2007-Present**
Biophysical Society (BS)	**2013-2014**
Council on Undergraduate Research (CUR)	**2011-2012**