# Phillip R. Smith

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## Education

**Stanford University**, Stanford, CA
Ph.D., Chemical Engineering GPA: 3.80 / 4.0 Expected 2011
Advisor: Dr. James R. Swartz
Dissertation: Development of a Synthetic Enzyme Pathway for the Conversion of Biomass to Hydrogen using a [FeFe] Hydrogenase

**Brigham Young University,** Provo, UT
M.S., Chemical Engineering GPA: 3.84 / 4.0 2005
Advisor: Dr. Calvin H. Bartholomew
Thesis: Generation of Biomarkers from Anthrax Spores by Catalysis and Analytical Pyrolysis

**Brigham Young University,** Provo, UT
B.S., Chemical Engineering GPA: 3.81 / 4.0 2003

## Research Experience

**Stanford University**, Stanford, CA
Graduate Research Assistant 2005-2011
Dr. James R. Swartz, Dept. of Chemical Engineering

- Overexpressed many proteins in *E. coli*, including polymerases, ferredoxins, hydrogenases, and flavoproteins at the 4-10L scale
- Purified the above proteins, using a variety of techniques, including ion exchange, affinity, and size exclusion chromatography
- Designed and characterized a synthetic enzyme pathway for producing hydrogen from biomass sugars at high productivities and yields
- Engineered a cell-free protein synthesis-based screening platform for directed enzyme evolution
- Designed and validated enzyme assays for measuring protein activities
- Mentored and trained five first-year PhD candidates

**Brigham Young University**, Provo, UT
Graduate Research Assistant 2003-2005
Dr. Calvin H. Bartholomew, Dept. of Chemical Engineering
Dr. Milton L. Lee, Dept. of Chemistry & Biochemistry

- Developed catalytic and pyrolytic methods to produce GC-MS detectable biomarkers for field detection of bio-warfare agents
- Designed and built catalytic reactors for catalyst screening with model compounds and detection by GC-MS
- Assisted writing Chapters 12 and 13 for: Bartholomew, C. H. and R. J. Farrauto (2006). Fundamentals of Industrial Catalytic Processes, 2nd edition, Wiley-Interscience. (Chapter 12 – Homogenous Catalysis, Enzyme Catalysis, and Polymerization Catalysis, Chapter 13 – Fuel Cells: A Path Toward the Hydrogen Economy)

**Brigham Young University**, Provo, UT
Undergraduate Research Assistant 2002
Dr. Calvin H. Bartholomew, Dept. of Chemical Engineering

- Prepared steam reforming catalysts
- Built and maintained catalytic reactors and control systems

**NASA Glenn Research Center**, Cleveland OH
Intern – Undergraduate Student Research Program (USRP) 2001, 2002
Dr. Michael A. Meador, Polymers Branch – Materials Division

- Characterized fluorescence spectra and fluorescence lifetimes of substituted tetraarylbenzodifuran charge-transfer fluorescent dyes
- Presented results of summer research at USRP symposium

**Brigham Young University**, Provo, UT
Undergraduate Research Assistant 2000-2002
Dr. David A. Berges, Dept. of Chemistry & Biochemistry

- Synthesized a series of organic small molecules designed to inhibit

glycosidase enzymes
- Learned organic synthesis techniques and basic laboratory practices
- Performed NMR spectroscopy

## Publications

- **Smith PR**, Bingham AS, Swartz JR. (2011). Generation of hydrogen from NADPH using a [FeFe] hydrogenase. International Journal of Hydrogen Energy
- Bingham AS, **Smith PR**, Swartz JR. (2011). Evolution of an [FeFe] hydrogenase with decreased oxygen sensitivity. International Journal of Hydrogen Energy
- **Smith, PR** (2005). Generation of Biomarkers from Anthrax Spores by Catalysis and Analytical Pyrolysis. Department of Chemical Engineering. Provo, Brigham Young University. Master of Science Thesis: 127.
- Liao L, Pang Y, Ding L, Karasz FE, **Smith PR** and Meador MA. (2004). Synthesis and luminescence of yellow/orange-emitting poly[tris(2,5-dihexyloxy-1,4-phenylenevinylene)- *alt*-(1,3-phenylenevinylene)]s. Journal of Polymer Science Part A: Polymer Chemistry, 42: 5853–5862.

## Technical Presentations (presenter underlined)

- **Smith PR**, Swartz JR. Biomass to Hydrogen via an [FeFe] Hydrogenase. American Institute of Chemical Engineers Annual Meeting, Salt Lake City, UT November 2010.
- Swartz JA, Bingham AS, **Smith PR**. Biohydrogen Generation. Global Climate and Energy Project at Stanford University Research Symposium, Stanford, CA, September 2010.
- Swartz JA, Boyer ME, Stapleton JA, Kuchenreuther JM, **Smith PR**, Bingham AS, Ortiz M. Direct Solar Biohydrogen – Five Years and Beyond. Global Climate and Energy Project at Stanford University Research Symposium, Stanford, CA, October 2008.
- Swartz JA, Boyer ME, Stapleton JA, Kuchenreuther JM, **Smith PR**. Direct Solar Biohydrogen. Global Climate and Energy Project at Stanford University Research Symposium, Stanford, CA, September 2006.
- **Smith PR**, Nackos AN, Zhijun J, Lee ML, Lee ED and Bartholomew CH. Detection of Biomarkers from Anthrax by Catalytic Reaction. 229th ACS National Meeting, San Diego, CA. March 2005.
- Meador MA, **Smith PR** and Tyson DS. Excited State Charge Transfer in Donor-Acceptor Substituted Benzofurans. 205th National Meeting of the Electrochemistry Society, San Antonio, TX. May 2004. Abstract 486.

## Poster Presentations

- **Smith PR**, Bingham AS, and Swartz JR. Glucose to Hydrogen via a General Enzymatic Pathway. Global Climate and Energy Project at Stanford University Research Symposium, Stanford, CA, September 2010.
- Bingham AS, **Smith PR**, Stapleton JA, Kuchenreuther JM, Swartz JR. Strategies for Hydrogen Production using [FeFe] Hydrogenase, Global Climate and Energy Project at Stanford University Research Symposium, Stanford, CA, October 2009.
- Stapleton JA, Kuchenreuther JM, **Smith PR**, Swartz JR. High-Throughput Directed Evolution of Hydrogenase for Oxygen Tolerance. Global Climate and Energy Project at Stanford University Research Symposium, Stanford, CA, 2007.
- **Smith PR** and Berges DA. Analogs of Distorted Glycosidase Substrates: Mimics of Sugars in Boat Conformations. American Chemical Society National Meeting, San Diego, CA, April 2001 Paper 40.

## Accomplishments, Awards, and Honors

- Distinguished Student Lecturer Award, Stanford GCEP Student Energy Lecture Series, 2011; selected to speak at the 2011 GCEP Symposium
- Passed Stanford University Department of Chemical Engineering qualifying examination, 2006
- BYU ORCA Grant Recipient, 2003
- Member of Tau Beta Pi (Engineering Honor Society), 2003
- BYU Joseph & Ruth Smith Scholarship, 2003
- BYU Academic Scholarships, 1996, 2000-2002
- Dean's list, College of Engineering and Technology, Winter 2000