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# Sara Lynn Walton

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## EDUCATION

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| Ph.D. Chemical Engineering<br>University of Maine                           | Expected - 2009 |
| B.S. Chemical Engineering ( <i>Summa cum Laude</i> )<br>University of Maine | 2005            |

## ACADEMIC EXPERIENCE

**Doctoral Research Associate in Chemical Engineering** 2005-2009  
University of Maine, Orono, ME

### Research Advisors:

Dr. Adriaan van Heiningen, Professor of Chemical Engineering  
Dr. G. Peter van Walsum, Associate Professor of Chemical Engineering

### Thesis Title:

“Biological Conversion of Hemicellulose Extract into Value-added Fuels and Chemicals”

- Conducted laboratory scale demonstration of proposed industrial process
- Extracted and analyzed hemicellulose from woodchips prior to kraft pulping by autohydrolysis and alkaline pretreatment methods
- Evaluated ultrafiltration and evaporation as concentration methods for hemicellulose oligomers
- Investigated fermentation of hemicellulose extracts into ethanol by *E. coli* K011 and into lactic acid by *Bacillus coagulans* MXL-9
- Examined inhibition effects of organic acids, salts and degradation products on fermentation organisms

## WORK EXPERIENCE

**Process Engineering Co-op** 2003-2004  
Georgia Pacific Pulp Mill, Old Town, ME

- Two semesters co-op in Technical Department
  - Participated on Mill Improvement Teams, implementing cost saving strategies.
  - Member of Liquor Cycle Review Team to reduce deadload.
  - Breakthrough Specialist on Liquor Solids Team developing mill WinGEMS model to balance evaporation vs. bleaching costs
  - Gathered data in preparation for chemical reactivity hazard evaluation of the mill, concerning mill chemicals, unloading stations, and current safety procedures; mapped process sewers
  - Assisted in new digester surfactant
- MAINE'S LAND GRANT AND SEA GRANT UNIVERSITY  
*A Member of the University of Maine System*
- chemical trial of  
and in softwood trial

## Laboratory Assistant

University of Maine Process Development Center, Orono, ME

2002-2004

- Performed laboratory tests and data collection at the Pulp and Paper Pilot Plant
- Prepared and tested mechanical properties of paper handsheets
- Tested drainage aids effect on filtration and water retention values

## MANUSCRIPTS UNDER REVIEW & IN PROGRESS

1. Sara Walton, Adriaan van Heiningen and G. Peter van Walsum. 2009: Production of lactic acid from hemicellulose extracts by *Bacillus coagulans* MXL-9. Manuscript in preparation for submission to *Journal of Industrial Microbiology & Biotechnology*.
2. Sara Walton, Dwane Hutto, G. Peter van Walsum and Adriaan van Heiningen. 2009: Value prior to pulping: Extraction of hemicellulose from hardwood. Manuscript in preparation for submission to *Applied Biochemistry and Biotechnology*.
3. Sara Walton, Adriaan van Heiningen and G. Peter van Walsum. 2009: Inhibition effects on fermentation of hardwood extracted hemicelluloses by acetic acid and sodium. *Bioresource Technology*. Submitted.
4. Sara Walton, G. Peter van Walsum, and Adriaan van Heiningen. 2009: Fermentation of near-neutral pH extracted hemicellulose derived from northern hardwood. Accepted to the peer-reviewed proceedings of the 8<sup>th</sup> World Congress on Chemical Engineering.

## ORAL PRESENTATIONS

1. Extraction and conversion of hemicellulose derived sugars: production of fuel ethanol by *E. coli* K011. AAAS Grant Review. October, 2008. Orono, ME.
2. Forest Bio-products Research Initiative at the University of Maine: The graduate student perspective. March, 2008. Project Learning Tree Seminar –Winter Harbor, ME.
3. Forest Bio-products Research Initiative at the University of Maine: The graduate student perspective. November, 2007. Project Learning Tree Seminar – Bucksport, ME.
4. Theme 3: Creation and commercialization of new bio-products: Production of ethanol from hemicellulose extracts. August, 2007. AAAS Grant Review, Orono, ME

## POSTER PRESENTATIONS

1. Sara Walton, Adriaan van Heiningen and G. Peter van Walsum: Fermentation of near-neutral pH extracted hemicellulose derived from northern hardwood, 8th World Congress of Chemical Engineering, Montreal, Quebec, August 23-27, 2009-Accepted.
2. Sara Walton, Adriaan van Heiningen and G. Peter van Walsum: Value prior to pulping: extraction of hemicellulose from hardwood, 31<sup>st</sup> Symposium on Biotechnology for Fuels and Chemicals, San Francisco, CA, May 3-6, 2009-Accepted.

3. Sara Walton, Adriaan van Heiningen and G. Peter van Walsum: Biological conversion of hemicellulose extracted from hardwood, 30<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals, New Orleans, LA, May 4-7, 2008.
4. Brian O’Flaherty, Sara Walton, Lourdes Pacheco, and George Barringer: Online solutions for bio-ethanol fermentation analysis. Poster presented by B. O’Flaherty, Groton Biosystems. September 2007.
5. Sara Walton and Adriaan van Heiningen: Biological conversion of hemicellulose extracted from hardwoods: Enabling co-production of ethanol and pulp in an integrated forest bio-refinery, 29<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals, Denver, CO, April 29 – May 2, 2007.
6. Sara Walton and Adriaan van Heiningen: Biological conversion of hemicellulose extracts from wood – Production of fuel ethanol by *Escherichia coli* K011, NSF EPSCOR National Conference, Lexington, KY, November, 2007.

## TEACHING EXPERIENCE

**Teaching Assistant**, University of Maine Department of Chemical & Biological Engineering

- **Unit Operations Laboratory**, Undergraduate, Fall 2006, Fall 2007  
*Responsibilities:*
  - Oversight of bio-reactor instruction laboratory
  - Training students on set-up and operation of 3L bioreactor vessel
  - Instruction on cell culture of *E. coli* and analytical methods for monitoring fermentation
- **Process Control**, Undergraduate, Summer 2006
- **Polymers**, Undergraduate, Spring 2006
- **Unit Operations 2**, Undergraduate, Fall 2005
- **Introduction to Chemical Engineering**, CHE 112, Undergraduate, Spring 2005  
*Responsibilities:*
  - Assisted in computer laboratory teaching basic functions of MS Excel and MathCAD

**Research Advisor**, University of Maine Department of Chemical & Biological Engineering

- University of Maine Undergraduate Researchers, Summer 2007 – Spring 2009
- Provided training and research guidance to an undergraduate student on Honors Thesis project entitled “Fermentation of hemicellulose extracts by *Pichia stipitis* CBS-6054.”
  - Provided assistance and guidance to an undergraduate student on HPLC analysis and fermentation of ion-exchanged hemicellulose extracts by *E. coli* K011 and *Bacillus coagulans* MXL-9.
  - Supervised an undergraduate student during operation of hemicellulose extraction digester, thin-film evaporator and hydrolysis of hemicellulose extracts.

NSF Research Experience for Undergraduates (REU), Summer 2008  
• Provided training and research guidance to an undergraduate student on project entitled “Production of ethanol and acetic acid from woodchips by anaerobic fermentation.”

NSF Research Experience for Undergraduates (REU), Summer 2007  
• Primary advisor, provided training and research guidance to an undergraduate student on project entitled “Inhibition effects of acetic acid on *Escherichia coli* K011.”

## **AWARDS, FELLOWSHIPS AND HONORS**

- University of Maine Doctoral Research Fellowship, September 2008- August 2009
- FBRI Graduate Research Assistantship, November 2006-August 2008
- Tau Beta Pi - Engineering Honor Society
- Pulp & Paper Foundation Scholarship
- National Merit Finalist

## **SERVICE AND ACTIVITIES**

- University Research Council – Graduate Student Representative, 2008-2009
  - Council makes recommendations to Vice President of Research
  - Served on Sub-committee for High-Tech Equipment
- Maine Tree Foundation - Project Learning Tree, 2007-2008
  - Organized hands-on lab experience for primary and secondary math & science teachers
- Society of Women Engineers, 2001-2008
  - Organized Girl Scout Badge Day, Ran Paper-making Activity

## **TECHNICAL SKILLS**

- High Performance Liquid Chromatography (HPLC) – Shimadzu
  - Bio-Rad Aminex HPX-87H and HPX-87P Columns
  - Extensive maintenance and operation experience
- Bacterial fermentation of ethanol and lactic acid
  - New Brunswick Scientific 3L BioFlo 110
  - DASGIP 400mL FedBatch Pro
  - Groton Biosystems Automated Reactor Sampling (ARS) System
  - Carbon dioxide monitoring
  - On-line cell density monitoring
- YSI Analyzer (Glucose, Ethanol, Lactate) – Interface with Groton ARS
- Cell culture
  - *Escherichia coli*
  - *Bacillus coagulans*
  - *Pichia stipitis*
  - *Clostridium phytofermentans* (obligate anaerobe)
- Pretreatment of lignocellulosic biomass (Alkaline and Hot water)
- Enzyme hydrolysis
- Evaporation – Thin Film Evaporator
- Ultrafiltration
  - Millipore - Pellicon 2 Mini
  - GE - Sepa CF
  - NovaSep - Kerasep (ceramic membrane)

## **GRADUATE COURSE WORK**

*Cumulative GPA 3.82*

Advanced Biochemistry  
Advanced Wood Chemistry  
Biological Methods for Engineers - Laboratory  
Chemical Engineering Analysis  
Chemical Engineering Kinetics  
Chemical Engineering Thermodynamics  
Sustainable Resource Systems & Public Policy  
Transport Phenomena

## **REFERENCES**

Available upon request