Seema Singh, Ph.D.

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Biomass Science and Conversion Technologies Department
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Professional Positions

2013- present Distinguished Member of the Technical Staff, Biomass Science and Conversion Technology Department, Sandia National laboratories

2009-2012 Principal Member of the Technical Staff, Biomass Science and Conversion Technology Department, Sandia National laboratories

2011-present Director- Biomass Pretreatment, Joint Bioenergy Institute, Emeryville, CA

2012-present Honorary/adjunct Professor, Beijing University of Chemical Technology**,** Beijing

2007-2011 Director- Material Science & Dynamics Studies of Biomass Pretreatment Joint Bioenergy Institute, Emeryville, CA

2007- present Guest Scientist, Lawrence Berkeley National Laboratory, Berkeley, CA

2006-2009 Senior Member of the Technical Staff, Biomass Science and Conversion Technology Department, Sandia National Laboratories (Mentor- Dr. Blake Simmons)

4/05-3/07 Limited term technical staff, Ceramic Processing and Science Department, (Mentor- Dr. Jeff Brinker) Sandia National Laboratories, Albuquerque-NM

1/03-4/05 Postdoc UNM/NSF Center for Micro-Engineered Materials (Mentor- Dr. Jeff Brinker) Chemical and Nuclear Engineering Department, University of New Mexico, Albuquerque-NM

5/96-1/99 Postdoc Sandia National Laboratories (Mentor- Dr. Alan Hurd) Materials Modeling and Simulation Department Sandia National Laboratories, Albuquerque- NM

6/95- 10/95 Visiting Scientist (Prof. Carlos Bustamante's Lab), Institute of Molecular Biology, University of Oregon, Eugene, OR

Education:

PhD Physical Chemistry/Biophysics, Scanning Force Microscopy of Biological Macromolecules, UNM, US (Mentor- Professor David Keller)
MS Physical Chemistry, Biophysics of Lipid Bilayer and Trans-membrane proteins, UNM, US
MS Organic Polymer Chemistry & Drugs and Antibiotics, UGKP, India
BS Majored in Chemistry and Biology, UGKP, India

Additional Academic Quests:

- **Energy Landscape**- Stanford University, 2013
- **The Berkeley Executive Leadership Program, Organizational Leadership-** UC Berkeley (2011)
- **Energy Policy,** UC Berkeley 2010
- **Coherent Raman Microscopy Workshop-** Harvard University (2009)
- **Computer Integrated Systems for Microscopy and Manipulation,** Force Measurement & Manipulation UNC (2007)
- **Proteomics-** Cold Spring Harbor Laboratory (2006)

Professional Certifications:

Multivariate Image analysis, Chemometrics, Near IR techniques, On-line process monitoring, Biophotonics, AFM in Biology, Electricity & electronics I, II, III

Professional Committee/Services:

- Organizing Committee Member (**2011- present) Symposium on Biotechnology for Fuels and Chemicals (SBFC)**
- DOE reviewer 2013 Systems Biology Enabled Research on the Role of Microbial Communities in Carbon Cycling
- Editorial board of Applied Biochemistry and Biotechnology.
- DOE reviewer for ORNL Biofuels SFA, 2012
- **AICHE Chair (2010- present)** Advances In Biofuels: DOE Bioenergy Research Centers Session I
- **AICHE Chair (2010- present)** Advances In Biofuels: DOE Bioenergy Research Centers Session II
- **Session Chair (Beijing 2012)** 3rd Asian-Pacific Conference on Ionic Liquid and Green Processes
- **Session Chair (Bio Pacific Rim, Honolulu HI, 2011)** Ionic Liquid in Green Processing
- Ph.D. Qualifying Exam Committee Vimalier Reyes-Ortiz, UCB
- Executive Member of Postdoctoral Development Program, SNL
- DOE-Energy facility Contactors Group (EFCOG)
- 'NEW MICROSCOPIES' at the Thirty-Ninth Annual Biophysical Society Meeting, February 12-16, 1995, San Francisco California

- **Journal Reviewer** (JACS, EES, Bioresource Technology, Biomass and Bioenergy, Biofuels, Biotechnology & Bioengineering, Biomacromolecules, Langmuir, Frontiers in Plant Biotechnology, Applied Biochemistry and Biotechnology, Biotechnology for Biofuels, Green Chemistry, PNAS, Nature Biotechnology, BioEnergy Research, Journal of Physical Chemistry, Agriculture, Industrial Biotechnology, Natural Resources, RSC Advances, J. Sustainable Bioenergy, Journal of Material Science and Engineering, JoVE, International Journal of Hydrogen Chemistry, Carbohydrate Polymer, Analytical Chemistry, Journal of Agricultural and Food Chemistry, Industrial and Engineering Chemistry Research
- CSEE BLIPS applicants review, 2010, 2011, 2012

Track Record

- Pioneered novel ionic liquid biomass pretreatment technologies
- Developed one step processing of algal biomass for oil and sugar fractionation from wet algae
- Developed methods to depolymerize polymeric lignin
- Conceived and established methods for rapid determination of Syrigyl/Guaiacyl ratio in lignin
- Advanced imaging using confocal FTIR, fluorescence, Raman and AFM for the study of biomass pretreatment. Purchased instruments and setup of both spectroscopy and microscopy facilities at JBEI
- Established methods to do high temperature confocal and high temperature AFM imaging
- Started two new sessions for Bioenergy Research Centers updates at AICHE
- Help start new award category to encourage biofuels research at SIM-SBFC
- Participated in LBL 'Integrated Bioimaging initiative' brainstorming workshops
- Developed optical tweezers based LTRS technique for In-Vivo Omics
- Developed single cell pulse amplitude modulation measurements methods for measuring photosynthesis at the single cell level
- Sole Sandian expert in high resolution BioAFM imaging (purchase and setup of 4 different AFMs at SNL/NM and SNL/CA locations)
- Sandia expert in patch-clamp and electrophysiology techniques
- Established methods/tools to understand physico-chemical changes to lignocellulosic bio-polymeric nano-composite as a unction of different pretreatments
- Principal investigator developing novel strains of algae for the production of advanced biofuels enabled by a fundamental understanding of the metabolic and physiological processes involved
- Developed Ion Channel based Sensor for stochastic sensing of ions, analytes etc.
- Interfacial nanoscience applied to the development of superhydrophobic surfaces
- Devised novel methods for membrane proteins reconstitution in lipid bilayer
- Expertise in thin film and powder processing techniques
- Developed selective optical sensor films for NO_2 and other environmentally toxic gases.
- Automation of optical sensor system for the monitoring of gases from aging rocket propellant.
- Developed methods to fabricate micro-porous ceramic membranes.

- Deviced and tested thin porous silica based 'aquaporin like' membranes for water desalination
- Synthesis and characterization of superhydrophobic, fractal silica surfaces mimicking those of the Lotus leaf, desert beetle and gecko feet. These surfaces are self cleaning and fundamentally affect flow, making them of general interest for fluidic-based microsystems (MEMS), and molecular integrated microsystem device (MIMS)
- Synthesis and mechanical testing of low weight-super strong aerogel-nanotube composite coating and ultra low friction coating.
- Self-Assembly of Porous and Composite Thin Film Nanostructures of interest for membranes, sensors, and low K dielectrics.
- Participated in multiple DOE (BER and EERE/OBP), USDA, and ARPA-E proposal teams for biomass conversion into biofuels
- Participated in program development activities around biomass, lignocellulosic biofuels, algal biofuels, lignin and advance multimodal imaging tools for SNL and JBEI
- Leads a group of 14 staff members, technologists, post-docs, and interns at JBEI (from Sandia, LBL and ALS)

News and Honors:

- Top cited articles published in BioEnergy Research, Springer, October 2012
- Status quo of the development of biomass energy at the DOE Joint Bioenergy Institute, BUCT, September 2012
- Dr. Seema Singh, a world-wide well known scientist in biofuels from Sandia National Labs appointed as an adjunct professor of Beijing University of Chemical technology, BUCT.com, September 2012
- Article by Singh, Vogel and Simmons chosen for the front cover of Biotechnology & Bioengineering (Vol 109 issue 4), April 2012
- Journal of Physical Chemistry B. Most read articles in 2011, March 2012
- Singh & team selected for R&D100 entry from sandia, January 2012 'Bioprospecting for Super-cells'
- JBEI and USDA researchers boost switchgrass biofuels potential by adding a maize gene; more starch, easier to extract, Green car congress November 2011
- Researchers boost switchgrass potential with corn gene, Ethanol Producer Magazine, November 2011
- Sandia spot award, 2011
- Researchers Make Cheaper Biofuel by Popping Corn Gene Into Switchgrass, DAILYTECH, November 2011
- A Corny Turn for Biofuels from Switchgrass: Berkeley Researchers Boost Switchgrass Biofuels Potential by Adding a Maize Gene to Switchgrass, November 2011
- Pinpointing lipid accumulation in algae Sandia Labnews, August 2011
- Biofuel researchers struggle to unlock sugars from lignin, Smartbrief, News AICHE, July 2011
- JBEI Researchers Develop Dynamic Visualization Technique to Assess Performance of Ionic Liquid Pretreatments of Biomass, Alternative Energy Newswire July 2011
- No Eureka Moments in Long U.S. Campaign to Crack Cellulosic Code, NY Times, Energy & Environment, July 2011
- Research promising for renewable and sustainable biofuels and chemicals, ORNL Neutron Sciences Directorate highlights, May 2011

- LIPID MAPS (Metabolite and Pathways Strategy): Lipids probed by Raman spectroscopy in living cells. A method devised by bioenergy researchers provides rapid, real-time information about the abundance and chemical composition of lipids in a single cell, March 2011
- In vivo lipidomics using single-cell Raman spectroscopy, Blog on Optical Tweezers, February, 2011
- Interactions between the osmotic and photo- adaption pathways of a salt-tolerant microalgae (First prize 4th annual Sandia Post-Doctoral Technical-showcase, 2011, Singh PI).
- Dr. Singh represents Sandia's Science & Technology at Fall Leadership Forum for Sandia executives, October 2009
- Fast-Tracking Better Ionic Liquids for Biomass Pretreatments, JBEI Research Highlights, 2009-2010 report
- DOE BRC DOE/SC-0127 JBEI research highlight 'New Approach to Visualize Biomass Solubilization During Ionic Liquid Pretreatment', July 2010
- Sandia spot award, 2009
- Next Generation Biofuels and Advanced Engines for Tomorrow's Transportation Needs, HITEC workshop, 2009
- Ionic liquids studied for use in biofuel manufacturing, Ecoseed, Renewable Bioenergy, July 2009
- Article by Singh, Vogel and Simmons chosen for front cover of Biotechnology & Bioengineering (issue 104), 2009
- JBEI fires 'opening solvo' with paper on deconstruction of switchgrass; technology breaks down plant wall to access sugars needed for ethanol. Sandia Labnews August 2009
- Biofuels work gets another adrenaline shot, sandia lab news, 2009
- Special Events: Jay Keasling, Terry Hazen, Ken Downing, Bahram Parvin, Seema Singh and Agnes Loscheid are to make presentations, May 2009
- JBEI researchers develop dynamic visualization technique to assess performance of ionic liquid pretreatment of biomass. Green car congress, 2009
- Visualizing the cellulose change to sugar. New energy and fuel, july 2009
- A new technique for getting fuels from Biomass, LBL news center 2009
- Expanding Professional Horizons-Applying expertise to a breadth of Discovery- Postdoc to project lead, Dr. Singh profiled in DOE LDRD brochure
- Fuels from Biomass: New technique can fast track better ionic liquids for biomass pretreatments, Science blog, Green car congress, Science daily, new energy and fuel, Berkeley news etc, 2009
- Biofuel Exploration/Energy Efficiency- Sandia Pioneered Research using 1064 nm Raman System, Bayspec press release, 2009
- R&D 100 Award 2008, Superhydrophobic Coating
- Recipient, Sandia Recognition Award, 2008
- Sandia Royalty Award, Sandia National Laboratories, 2006
- Sandia researchers solve mystery of attractive surfaces, work featured in nature, Sandia Labnews, 2006
- Nanotech Briefs, Engineering Breakthroughs in Nanotechnology and MEMS, 2006, Researchers solve Mystery of Attractive forces
- Sandia Researchers Solve Mystery of Attractive Surfaces where does the hydrophobic force come from? 10 August 2006, Sci/Tech News
- Nature Biochemical, September, 2006 Evaporated Biosensors
- Scientific Frontline The latest Scientific Research, August 2, 1996,

- 'Sandia Researchers First to solve the Mystery of Attractive Forces' EE Times, July, 2006
- Scientific American, October 2006, vol 295, 4, Physics, Bubble Adhesion.
- Live from outer space: how cells influence the growth of nanostructures, ANL, APS science highlights 2006
- Sandia National Laboratories' Student Symposium, Albuquerque, NM, August 2, 2007. First Prize, Undergraduate Student Poster Competition Gecko Inspired Super Adhesives
- Third Prize, Gecko Inspired Super Adhesives Patrick Johnson, Eric Branson, C. Jeffrey Brinker, and Seema Singh, First Prize, Industrial Board Meeting for the Center for MicroEngineered Materials, Cell Directed Assembly of 3-D Bio-Nano Interfaces, October 2005

Leadership Roles:

- Director- Biomass Pretreatment- Deconstruction Division, DOE-Joint Bioenergy Institute
- Director- Material Science and Dynamic Studies of Biomass Pretreatment- Deconstruction Division, DOE-Joint Bioenergy Institute
- Executive Member of Postdoctoral Development Program, SNL
- DOE-Energy facility Contactors Group (EFCOG)
- Mentored over 45 undergraduates, graduate and postdocs throughout professional career
- Collaborated and worked on projects involving international visitors (faculties and postdocs (industry and academic)
- Currently Leading a team of 14 members at JBEI and 5 team members at Sandia
- Interview team LBL Biochemist Research Scientist
- Responsible for screening and interview and help with hiring of all the postdocs in pretreatment group and many in other divisions (deconstruction, feedstock and technologies)

Current Funded Research Projects

1. DOE BER funded Joint Bioenergy Institute FY08-17 (Lead for Biomass Pretreatment)
2. Statoil CRADA 'Deconstruction of Macroalgae for fuels and Chemicals' (Project Lead)
3. Microbial Lignolysis LDRD (PI)

Recently Completed LDRDs

10/01/08-9/30/11
From algae to oilgae: In-situ studies of the factors controlling growth, oil production, and oil excretion in microalgae
Role: PI

10/01/08-9/30/11
K Channels: On/Off Switches of Innate Immune Responses
Role: Team Member

10/01/08-9/30/11
Membranes and Surfaces Nano-engineered for Pathogen Capture and Destruction
Role: Team Member

10/01/07-9/30/10
Computational and Experimental Platform for Understanding and Optimizing Water Flux and Salt Rejection in Nanoporous Membranes
Role: Team Member

10/01/07-09/30/09
Understanding and Optimizing Water Flux and Salt Rejection in Nanoporous Membranes
Role: Team Member

10/01/07-9/30/08
Gecko-Inspired Super-adhesive Coatings
Fabrication of Self-cleaning Synthetic Adhesive Surfaces Mimicking Tokay Geckos
Role: PI

10/01/06- 9/30/08
Discovery, Integration, and Interrogation of Biotic/Abiotic Materials and Systems
Role: Team Member

10/01/03-9/30/03
Nanostructured Polyoxometalate Arrays with Unprecedented Properties and Functions
Role: Team Member

10/01/03-9/30/06
Grand Challenge LDRD: Interfacial water
Role: Team Member

10/01/04-9/30/07
Superhydrophobic Surface Coatings for Microfluidics and MEMS
Role: Team Member

10/01/99-9/30/01
Autonomous optical sensor system for the monitoring of nitrogen dioxide from aging rocket propellant
Role: Team Member

* Worked on four other LDRDs during postdoc years (1996-1999) at sandia

External Projects

NSF SBIR 1047347 (with BaySpec Inc) 2011
A Real-time Infrared Raman-based Microalgal Analyzer for Monitoring Biofuel Production
Conceived the idea, wrote and handed the proposal to Bayspec to submit

AFOSR Project (2003) C. J. Brinker (PI) **Self Assembly of Functional Nanostructures**
Role: Help write and co-lead the project
Worked on Biocompatible Self-Assembled nanostructures for Immobilization and Patterning of Whole Cells

NIH Nanomedicine Project (2006-2008) Eric Jakobbson (PI)
National Center for Design of Biomimetic Nanoconductors: **Understanding and quantitatively characterizing biomembrane and other nanoscale transport processes**
Role: Team lead for developing synthetic platforms and analogues of natural ion and molecular transporters/channels

MOLDICE Project (2006): **Engineered Bio-Molecular and Nano- Devices/Systems (PI Jeff Brinker)**
Role: Patterning of Engineered Biotic/Abiotic nanostructures for Biological-to-Digital Signal Transduction

BES Project (2003-2004): **Rolling and Colossal Slip on Superhydrophobic Surfaces** (PI Brinker and van Swol)
Role: 1) Worked on 'Containerless' Fluidic Architectures and understanding liquid transport on SH Surfaces 2) Construction of Improved electrochemical cell and synthetic ion channels with capability of selectively transporting/blocking ions of interest

VAISALA (Helsinki, Finland) Project (2002): **Membrane Pore Size Tuning for Metrology application**
Role: Team Lead

Selected Publications:

1. Assessment of Lignocellulosic Biomass using Analytical Spectroscopy: An Evolution to High Throughput Techniques Jason S. Lupoi, Seema Singh, Blake A. Simmons, and Robert J. Henry, *BioEnergy Research* Accepted, June 2013
2. Stephanie A. Eichorst, Vatalie Stavila, Marcin Zemla, Manfred Auer, Seems Singh, Blake A. Simmons, Steven W. Singer **Community Dynamics of Cellulose-Adapted Thermophilic Consortia**, *Environmental Microbiology,* accepted, May 2013.
3. Aaron M Socha, Samuel Plummer, Vitalie Stavila, Blake A Simmons and Seema Singh. **Comparison of sugar content for ionic liquid pretreated Douglas-fir woodchips and forestry residues**. *Biotechnology for Biofuels*, in press April 2013.
4. Dawn Chiniquy, Patanjali Varanasi, Taeyun Oh, Jesper Harholt, Jacob Katnelson, Seema Singh, Manfred Auer, Blake Simmons, Paul D. Adams, Henrik V. Scheller, Pamela C. Ronald. **Three novel rice genes closely related to the Arabidopsis IRX9, IRX9L, and IRX14 genes and their roles in xylan biosynthesis,** *Frontiers in Plant* Biotechnology, 2013, 4(83), 1-13.
5. Ning Sun, Hanbin Liu, Noppadon Sathitsuksanoh, Vitalie Stavila, Manali Sawant, Anaise Bonito, Kim Tran, Anthe George, Kenneth L Sale, Seema Singh, Blake A Simmons and Bradley M Holmes. **Production and Extraction of Sugars from Switchgrass Hydrolyzed in Ionic Liquids**, *Biotechnology for Biofuels,* 2013, 6:39.

6. Alejandro G. Cruz, Chessa Scullin, Chen Mu, Gang Cheng, Vitalie Stavila, Patanjali Varanasi, Jeff Mentel, DongYan Xu, Yi-De A. Chung, Blake Simmons and Seema Singh. **Impact of High Biomass Loading on Ionic Liquid Pretreatment,** *Biotechnology for Biofuels*, 2013, **6**:52.
7. Seema Singh; Patanjali Varanasi; Priyanka Singh; Paul Adams; Manfred Auer; Blake Simmons. **Understanding the Impact of Ionic Liquid Pretreatment on Cellulose and Lignin via Thermochemical Analysis,** *Biomass & Bioenergy*, (2013), pp. 276-283.
8. Varanasi, P.; Singh, P.; Auer, M.; Adams, P.D.; Simmons, B.A.; Singh, S. **Survey of Renewable Chemicals Produced from Lignocellulosic Biomass during Ionic Liquid Pretreatment**, *Biotechnology for Biofuels*, 2013, 6**(**14).
9. Li, Chenlin; Sun, Lan; Simmons, Blake; Singh, Seema. **Comparing the Recalcitrance of Eucalyptus, Pine, and Switchgrass using Ionic Liquid and Dilute Acid Pretreatments**, *BioEnergy Research*, March 2013, 6(1), 14-23.
10. Patanjali Varanasi, Priyanka Singh, Rohit Arora, Paul D. Adams, Manfred Auer, Blake A. Simmons, and Seema Singh. **Understanding changes in lignin of *Panicum virgatum* and *Eucalyptus globulus* as a function of ionic liquid pretreatment,** *Bioresource Technology*, 2013, 6:14
11. Seema Singh and Blake Simmons, **Ionic Liquid Pretreatment: Mechanism, Performance, and Challenges**, *Aqueous Pretreatment of Plant Biomass for Biological and Chemical Conversion to Fuels and Chemicals*, Wiley Blackwell, ed. Charles Wyman, in press October 2012
12. Jose A. Perez-Pimienta, Monica G. Lopez-Ortega, Patanjali Varanasi, Vitalie Stavila, Gang Cheng, Seema Singh, Blake A. Simmons. **Comparing the Impact of Ionic Liquid Pretreatment on Agave Bagasse and Switchgrass**, *Bioresource Technology*, 2013, 127, 18–24.
13. Jian Shi, Vicki S. Thompson, Neal A. Yancey, Vitalie Stavila, Blake A. Simmons, and Seema Singh. **Impact of Mixed Feedstocks and Feedstock Densification on Ionic Liquid Pretreatment Efficiency**, *Biofuels*, Jan 2013, 4(1), 63-72.
14. Lan Sun, Chenlin Li, Zhengjun Xue, Blake A. Simmons, and Seema Singh, **Unveiling High-Resolution, Tissue Specific Dynamic Changes in Corn Stover during Ionic Liquid Pretreatment**, *RSC Advances*, 2013, 3, 2017-2027
15. Cheng, Gang; Varanasi, Patanjali; Arora, Rohit; Stavila, Vitalie; Simmons, Blake; Kent, Michael; Singh, Seema. **Impact of Ionic Liquid Pretreatment Conditions on Cellulose Crystalline Structure Using 1-Ethyl-3-Methylimidazolium Acetate**, *Journal of Physical Chemistry B*, 2012, 116, 10049-10054.
16. Patanjali Varanasi, Jacob Katsnelson, David Larson, Rita Sharma, Manoj Sharma, Miguel Vega-Sanchez, Marcin Zemla, Pamela Ronald, Blake Simmons, Seema Singh, Paul Adams, and Manfred Auer, **Mechanical Stress Analysis as a Method to Understand the Impact of Genetically Engineered Rice and Arabidopsis Plants**, *Industrial Biotechnology*, 2012, 8(4), 238-244.
17. Gang Cheng, Michael S. Kent, Lilin He, Patanjali Varanasi, Dean Dibble, Rohit Arora, Kai Deng, Kunlun Hong, Yuri B. Melnichenko, Blake A. Simmons, and Seema Singh, **Effect of Ionic Liquid Treatment on the Structures of Lignins in Solutions: Molecular Subunits Released from Lignin**, *Langmuir*, 2012, *28*, 1850-11857.
18. Vega-Sanchez, Miguel E.; Verhertbruggen, Yves; Christensen, Ulla; Chen, Xuewei; Sharma, Vaishali; Varanasi, Patanjali; Jobling, Stephen A.; Talbot, Mark; White, Rosemary G.; Joo, Michael; Singh, Seema; Auer, Manfred; Scheller, Henrik V.; Ronald, Pamela C. **Loss of**

Cellulose synthase-like F6 function affects mixed-linkage glucan deposition, cell wall mechanical properties, and defense responses in vegetative tissues of rice, *Plant Physiology*, 2012, 159(1), 56-69.

19. Liu, Hanbin; Cheng, Gang; Kent, Michael; Stavila, Vitalie; Simmons, Blake; Sale, Kenneth; Singh, Seema. **Simulations Reveal Conformational Changes of Methylhydroxyl Groups during Dissolution of Cellulose Iβ in Ionic Liquid 1-Ethyl-3-Methyl Imidazolium Acetate**, *Journal of Physical Chemistry B*, 2012, 116(28), 8131–8138.
20. Li, Chenlin; Sun, Lan; Simmons, Blake; Singh, Seema. **Comparing the Recalcitrance of Eucalyptus, Pine, and Switchgrass using Ionic Liquid and Dilute Acid Pretreatments**, *BioEnergy Research*, published online May 2012, doi: DOI 10.1007/s12155-012-9220-4.
21. Ryan W. Davis, Joanne V. Volponi,Howland D.T. Jones, Benjamin J. Carvalho, Huawen Wu, Seema Singh. Multiplex fluorometric assessment of nutrient limitation as a strategy for enhanced lipid enrichment and harvesting of *Neochloris oleoabundans,* Biotechnology and Bioengineering , volume 109, Issue 10, pages 2503–2512, October 2012
22. Gabriella Papa, Patanjali Varanasi, Lan Sun, Gang Cheng, Vitalie Stavila, Bradley M. Holmes, Blake A. Simmons, Fabrizio Adani, and Seema Singh. **Exploring the effect of different plant lignin content and composition on ionic liquid pretreatment efficiency and enzymatic saccharification of *Eucalyptus globulus* L. mutants**, *Bioresource Technology*, 2012, 117, 352-359.
23. Aymerick Eudes, Anthe George, Purba Mukerjee, Jin S. Kim, Brigitte Pollet, Peter I. Benke, Fan Yang, Prajakta Mitra, Lan Sun, Ozgul P. Cetinkol, Salem Chabout, Gregory Mouille, Ludivine Soubigou-Taconnat, Sandrine Balzergue, Seema Singh, Bradley M. Holmes, Aindrila Mukhopadhyay, Jay D. Keasling, Blake A. Simmons, Catherine Lapierre, John Ralph and Dominique Loque´. **Biosynthesis and incorporation of side-chain-truncated lignin monomers to reduce lignin polymerization and enhance saccharification**, *Plant Biotechnology Journal*, 2012, 10(5), 609-620.
24. Wolfgang Reindl, Kai Deng, Xiaoliang Cheng, Anup K. Singh, Blake A. Simmons, Paul D. Adams, and Trent R. Northen. **Nanostructure-Initiator Mass Spectrometry (NIMS) for the Analysis of Enzyme Activities**, *Current Protocols in Chemical Biology*, accepted February 2012
25. Lan Sun, Patanjali Varanasi, Fan Yang, Dominique Loqué, Blake A. Simmons and Seema Singh. **Rapid Determination of Syringyl:Guaiacyl Ratios Using FT-Raman Spectroscopy**, *Biotechnology and Bioengineering*, 2012, 109(3), 647-56.
26. Wu, H,; Volponi, J.; Oliver, A.; Parikh, A.; Simmons, B.; Singh, S.*, In-Vivo Lipidomics by Single Cell Raman Spectroscopy, **PNAS***,* 108, 3809-3814 2011.
27. George Chuck, Christian Tobias, Lan Sun, Florian Kraemer, Chenlin Li, Rohit Arora, Jennifer N. Bragg, John P. Vogel, Seema Singh, Blake Simmons, Markus Pauly and Sarah Hake **Overexpression of the maize Corngrass1 microRNA gene prevents flowering, improves digestibility and increases starch content of biofuel crop plants**, *PNAS*, October 18, 2011, 108(42), 17550-17555.
28. Dean C. Dibble, Chenlin Li , Lan Sun, Anthe George, Aurelia Cheng, Özgül Persil Çetinkol, Peter Benke, Bradley M. Holmes, Seema Singh, Blake A.Simmons **A facile method for the recovery of ionic liquid and lignin from biomass pretreatment**, *Green Chemistry*, 2011,13, 3255-3264.

29. Reindl, W.; Deng, K.; Gladden, J.M.; Cheng, G.; Wong, A.; Singer, S.W.; Singh, S.; Lee, J.-C.; Yao, C.-H.; Hazen, T.C.; Singh, A.K.; Simmons, B.A.; Adams, P.D.; Northen, T.R. **Colloid-based multiplexed screening for plant biomass-degrading glycoside hydrolase activities in microbial communities**, *Energy and Environmental Science*, 2011, 4, 2884-2893.
30. Liu, H.; Sale, K.; Simmons, B.A.; Singh, S. **Molecular Dynamics Study of Polysaccharides in Binary Solvent Mixtures of Ionic Liquid and Water**, *Journal of Physical Chemistry*, (2011), 115(34), 10251-10258.
31. Ouellet, M.; Datta, S.; Dibble, D.C.; Tamrakar, P.R.; Benke, P.I.; Li, C.; Singh, S.; Adams, P.D.; Keasling, J.D.; Simmons, B.A.; Holmes, B.M.; Mukhopadhyay, A. **Impact of ionic liquid pretreated plant biomass on *Saccharomyces cerevisiae* growth and biofuel production**, *Green Chemistry*, 2011, 13, 2743-2749.
32. Patanjali Varanasi, Lan Sun, Bernhard Knierim, Elena Bosneaga, Purbasha Sarkar, Seema Singh and Manfred Auer. **Quantifying Bio-Engineering: The Importance of Biophysics in Biofuel Research**, Biofuel's Engineering Process Technology, 2011, M.A. dos Santos Bernades, InTech, 493-520.
33. Li, C.; Cheng, G.; Balan, V.; Kent, M.S.; Ong, M.; Chundawat, S.; daCosta Sousa, L.; Melnichenko, Y.B.; Dale, B.E.; Simmons, B.A.; Singh, S. **Influence of Physico-Chemical Changes on Enzymatic Digestibility of Ionic Liquid and AFEX pretreated Corn Stover**, *Bioresource Technology*, 2011, 102(13), 6928-6936.
34. Cheng, Gang; Varanasi, Patanjali; Li, Chenlin; Liu, Hanbin; Melnichenko, Yuri; Simmons, Blake; Kent, Michael; Singh, Seema, **Transition of Cellulose Crystalline Structure and Surface Morphology of Biomass as a Function of Ionic Liquid Pretreatment and its Relation to Enzymatic Hydrolysis**, *Biomacromolecules*, 2011, 12(6), 2216-2224.
35. Bharadwaj, Rajiv; Wong, April; Knierim, Bernhard; Singh, Seema; Holmes, Bradley M.; Auer, Manfred; Simmons, Blake A.; Adams, Paul D.; Singh, Anup K. **High-throughput enzymatic hydrolysis of lignocellulosic biomass via in-situ regeneration**. *Bioresource Technology*, 2011, 102(2), 1329-1337.
36. Sun, Lan, Simmons, Blake, Singh, Seema. **Understanding Tissue Specific Compositions of Bioenergy Feedstocks through Hyperspectral Raman Imaging**. *Biotechnology and Bioengineering*, 2011, 108 (2), 286-295.
37. Henrik Vibe Scheller, Seema Singh, Harvey Blanch and Jay D. Keasling **The Joint BioEnergy Institute (JBEI): Developing New Biofuels by Overcoming Biomass Recalcitrance**. *Bioenerg. Res.*(2010) 3:105--107.
38. Han J., Singh S., Sun L., Simmons B.A., Auer M. and Parvin B. **Chemical Profiling of the Plant Cell Wall through Raman Microspectroscopy**, *Proceedings of Biomedical Imaging: From Nano to Macro*, 2010 IEEE International Symposium, 2010, 1273 - 1276.
39. Single-Cell Diesel Mining on Microalgae: Direct and Quantitative Monitoring of Microalgal Oil Production In Vivo by Raman Spectroscopy, Biophysical Journal, vol. 98, issue 3, pp. 744a-744a
40. Arora R., Manisseri C., Li C., Scheller H.V., Simmons B.A., Singh S. **Monitoring and Analyzing Process Streams towards Understanding Ionic Liquid Pretreatment of Switchgrass (Panicum virgatum)**, *BioEnergy Research,* 2010, 3, 134--145.
41. Simmons B.A., Singh S., Holmes B.M., Blanch H.W. **Ionic Liquid Pretreatment**, *Chemical Engineering Progress*, 2010, 106(3), 50-55.
42. Liu H., Sale K.L., Holmes B.M., Simmons B.A., Singh S. **Understanding the Interactions of Cellulose with Ionic Liquids: A Molecular Dynamics Study**. *Journal of Physical Chemistry B*, 2010, 114(12), 4293-4301.

43. Li C, Knierim B, Manisseri C, Scheller HV, Vogel K, Simmons B, Singh S. **Comparison of dilute acid and ionic liquid pretreatment of switchgrass: Biomass recalcitrance, delignification and enzymatic saccharification.** *Bioresource Technology*, 2010, 101 (13) 4900-4906.
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Publications Submitted/Under Review

1. **Scale-up and Evaluation of High Solid Ionic Liquid Pretreatment and Enzymatic Hydrolysis of Switchgrass** Chenlin Li, Deepti Tanjore, Wei He, Jessica Wong, James L. Gardner, Kenneth Sale, Blake A. Simmons, Seema Singh
2. **Mapping Energy Flow in Advanced Biofuel Production: A Case Study of Pilot Scale Ionic Liquid Pretreatment and Enzymatic Hydrolysis of Lignocellulosic Biomass** Wei He, Jessica Wong, Deepti Tanjore, Chenlin Li, James L. Gardner, Kenneth Sale, Blake A. Simmons , Seema Singh
3. **Developing Task-Specific Ionic Liquids: Understanding the Role of the Cation and Anion in Biomass Pretreatment**, Ning Sun, Ramakrishnan Parthasarathi, Aaron M. Socha, Jian Shi, Sonny Zhang, Vitalie Stavila, Kenneth L. Sale, Blake A. Simmons and Seema Singh
4. **Comparison of Enzymatic Reactivity of Corn Stover Solids Prepared by Dilute Acid, AFEX, and Ionic Liquid** Pretreatments, Xiadi Gao, Rajeev Kumar, Seema Singh, Blake Simmons, Venkatesh Balan, Bruce Dale, Charles E. Wyman **Biotechnology for Biofuels**
5. **Comparing the impacts of dilute acid (DA), ammonia fiber expansion (AFEX) and ionic liquid (IL) pretreatments on corn stover using physical and thermochemical analytical techniques,** Seema Singh, Patanjali Varanasi, Gang Cheng ,Venkatesh Balan, Xiadi Gao, Michael Kent, Vitalie Stavila, Yuri B Melnichenko, Bruce Dale, Charlie Wyman, and Blake A. Simmons, **Biotechnology for Biofuels**
6. **A Comparative Study of Producing Ethanol using Dilute Acid, Ionic Liquid and AFEX(TM) Pretreated Corn Stover.** Nirmal Uppugundla, Leonardo da Costa Sousa, Shishir P.S. Chundawat, Xiurong Yu, Simmons Blake, Seema Singh, Xiadi Gao, Charles E Wyman, Bruce E Dale and Venkatesh Balan, **Biotechnology for Biofuels**

SAND Reports (selected):

1. **From Algae to Oilgae: in-situ Studies of Factors Controlling Growth and Oil Production** SAND2011-7241
2. **Environmental perturbations to fluorescent proteins allow unambiguous discrimination of constructs with identical sequence.** *Sandia Technical Report* (SAND2011-0780J).
3. **Computational and Experimental Platform for Understanding and Optimizing Water Flux and Salt Rejection in Nanoporous Membranes** SAND2010-6735
4. **Self-Cleaning Synthetic Adhesive Surfaces Mimicking Tokay Geckos** SAND2006-
5. **Superhydrophobic Surface Coatings for Microfluidics and MEMS** SAND2006
6. **Exploiting Interfacial Water Properties for Desalination and Purification Applications** SAND2008-5729 (Grand challenge)
7. **Cell-Directed Assembly of an Integrated Nanoelectronic/Nanophotonic Device for Probing Cellular Responses on the Nanoscale** SAND2005-7951
8. **Nanostructured Polyoxometalate Arrays with Unprecedented Prperties and Functions** SAND2003-3818
9. **Autonomous Optical Sensor System for the Monitoring of Nitrogen Dioxide from Aging Rocket Propellant** SAND2001-2953

10. **Oriented Inorganic Thin Film Channel Structures with Uni-Directional Monosize Micropores** SAND97-2397

Selected Invited Presentations (total presentation over 175):

1. Seema Singh (Invited) Linking Forestry and Oil & Gas to Advance the Bioeconomy, Edmonton, Canada, April 23-25, 2013.
2. Light, Force and (Inter)actions: New Instrumentations for Biofuels Research, Pittcon, 2013 (invited by Susan Gregurick and Ronald Hirsch, DOE BER)
3. Invited to present at ACS 2013 special symposium "100 years of cellulose fiber diffraction and the emergence of complementary techniques"
4. Invited to present at ACS 2013 New Orleans symposium on "Characterization of Algal Lipids"
5. Invited to present at FuBio symposium on Cellulose & Biomass Processing with Aqueous Ionic Liquid media in Helsinki, Finland, May 2013
6. Seema Singh Development of efficient, affordable and scalable ionic liquid pretreatment technology: current and future efforts at JBEI, Invited, Annual Meeting of the American Institute of Chemical Engineers, Pittsburgh, PA. Oct 28-Nov 2, 2012.
7. Seema Singh (**Keynote**) Ionic Liquids: Developing and Realizing a Scalable and Cost-Effective Biomass Pretreatment Technology, 3rd Asia Pacific Conference on Ionic Liquids and Green processes, Beijing, China, Sept 17-19, 2012.
8. Seema Singh (Invited) Development and Demonstration of an Integrated Biomass Sugar Production Platform based on Ionic Liquids, CAS, Beijing, China, Sept 18, 2012
9. Seema Singh (Invited) Enabling the next generation of advanced fuels: the Joint Bio-Energy Institute, BUCT, China, Sept 19, 2012
10. Invited to present at Spring MRS 2012 symposium on "Functional Materials and Ionic Liquids"
11. Singh, Seema (**Plenary talk**). Development and Demonstration of an Integrated Biomass Sugar Production Platform based on Ionic Liquids, GLBRC deconstruction retreat, January 9-10, 2012
12. Seema Singh. Evaluation of Modified Feedstocks for Deconstructionability, Invited. AIChE National Meeting, October 16-21, 2011, Minneapolis, MN.
13. Singh, Seema (Invited). Feedstock Agnostic Pretreatment Technology for Efficient Hydrolysis of Bioenergy Crops, AICHE 2010 Annual Meeting, Salt Lake City, Utah, November 7th-12th 2010.
14. Singh, Seema (Invited). Overview of Lignocellulosic Pretreatment & Algal Biofuel Research Efforts at JBEI and Sandia, Nextgen fuel conference, Delhi, November, 2010.
15. Seema Singh (Invited **Keynote**) Enabling the Next-Generation of Advanced Biofuels: the Joint Bioenergy Institute. 4th Congress on Ionic Liquids, Washington DC, June 15-18, 2011.
16. S. Singh (Invited) Mimicking Nature: From Superydrophobic Surfaces to Advanced Fuels, DN College, India, Jan, 2010
17. Singh, Seema. Enabling the next- Generation of Advanced Biofuels: Pretreatment Efforts at the Joint BioEnergy Institute. International conference on biomass and energy technologies, Beijing, China August 20-23, 2010.
18. Singh, Seema. (Invited) Overview of Pretreatment Efforts at JBEI and Algae to Oilgae Project at Sandia. Qingdao, China. August 26, 2010
19. Singh, S. The Joint BioEnergy Institute, John F. Kennedy High's Career Day, April 24, 2009
20. Singh, S. (Invited) Enabling the Next Generation of Advanced Biofuels: The Joint BioEnergy Institute, Sandia Fall Leadership Forum, October, 2009

21. Singh, S. (Invited) Ligno-Cellulose Imaging and Fundamental Study of Ionic Liquids as Hydrolytic Reaction Media for Cellulosic Biomass, GRC on Plant Cell Wall, New Hampshire, 2008
22. Slippery Surfaces, Super-Adhesive Coating and Ion-channel Based Devices, Invited Talk, NIST, 2007
23. In-Vivo Lipidomics, 101AOCS Meeting, Phoenix Arizona
24. Single cell Raman Spectroscopy, Cold Spring Harbor Labs, Single Cell Methods, 2009

Patent Awarded/Disclosures:

- Mixed feedstock processing using ionic liquids (ROI)
- Synthesis of novel ionic liquid from monolignols (ROI)
- Renewable aromatics from lignocellulosic lignin (Provisional Patent filed)
- Recovery of ionic liquid and lignin from biomass pretreatment utilizing iron nanoparticles (TA)
- Single Cell PAM (TA)
- Single Cell Biodiesel Mining on Microalgae by Raman Tweezers (TA)
- Label-free Hyperspectral Imaging of Algal Lipid Production (TA)
- Mesoporous Sol-gel Supported Lipid Bilayer for Biosensor Applications (TA)
- A Cell-Based Biosensor (TA)
- Preparation of Hydrophobic Coatings. U.S. Patent No. 7,485,343 B1, Issued February 3,
- Trent R Northen, Wolfgang E Reindl, Kai Deng, Seema Singh, Anup K Singh: Multiplexed screening of enzyme activities using nanostructure-initiator mass spectrometry. Sandia Sep, 6 2012: US 20120225797

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Professional Membership:

- Biophysical Society member
- American Chemical Society
- AICHE
- Material Research Society
- Member SPIE