Executive Summary

We just completed a 10-year review of our program for the college and campus. A lot has been happening in the department in the past decade and I am happy to report that the Biological Systems Engineering program is thriving.

Undergraduate enrollment is at an all-time high with continued growth projected into the future. We have become one of the largest of the applied agriculture departments in the college as indicted by number of degrees granted by program. The success of our undergraduate program is great news and has stressed our instructional capacity, especially for our lab courses.

We attribute this growth to our relevance in meeting the grand challenges at the intersection of population growth, quality food supply and, environmental quality, combined with our reputation of high-quality, personalized instruction and the success of job placement for our students.

Our graduate instruction and research programs are also thriving with major growth in research grants and associated graduate student numbers in the department since our last program review. Our Extension program is highly regarded in the UWEX system. While the number of Extension faculty FTEs have declined in the past 10 years, our Extension faculty have responded by developing alternate sources of funding for our extension and outreach efforts.

Our faculty and staff enjoy a productive and collegial atmosphere, as indicated by a recent department climate survey. We are faced with budgetary challenges in the next biennium and are looking for ways to maintain the high level of scholarly activity and high quality of undergraduate and graduate instruction and extension and outreach for which we are known. The support of our alumni and friends is becoming increasingly important to help us meet these challenges.

Douglas J. Reinemann, Professor and Chair
Biological Systems Engineering Department, University of Wisconsin-Madison
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FACULTY
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Bohnhoff, David R.: Professor, Ph.D., Teaching/Research
Choi, Christopher: Professor, Ph.D., Teaching/Research
Gunasekaran, Sungaram: Professor, Ph.D., Teaching/Research
Kammel, David W.: Professor, Ph.D., Extension/Research
Karthikeyan, K.G.: Professor, Ph.D., Teaching/Research
Larson, Rebecca: Assistant Professor, Ph.D., Teaching/Research
Pan, Xuejun: Assistant Professor, Ph.D., Teaching/Research
Reinemann, Douglas J.: BSE Chair, Professor, Ph.D., Extension/Teaching/Research
Runge, Troy: Assistant Professor, Ph.D., Teaching/Research
Shinners, Kevin J.: Professor, Ph.D., Teaching/Research
Straub, Richard J.: Professor, Ph.D., Teaching/Research, Associate Dean of CALS
Thompson, Anita M.: Associate Professor, Ph.D., Teaching/Research

JOINT& ADJUNCT FACULTY
Etzel, Mark: Professor, Ph.D., Food Science
Hanna, Awad: Professor, Ph.D., Civil & Environmental Engineering
Hartel, Richard: Professor, Ph.D., Food Science
Kung, King-Jau (Sam): Professor, Ph.D., Soil Science
Muck, Richard: Professor, Ph.D., USDA Agricultural Research Service
Nelson, Shawn: Associate Professor, Ph.D., Biological Systems Engineering
O’Leary, Philip: Professor, Ph.D., Engineering Professional Development
Purschwitz, Mark A.: Associate Professor, Ph.D., Farm Safety
Ralph, John: Professor, Ph.D., Biochemistry
Roa-Espinosa, Aicardo: Professor, Ph.D., CEO Soil Net
Shutske, John: Professor, Ph.D., Teaching/Research, Associate Dean of CALS
Thompson, Paul D.: Professor, Ph.D., Senior Scientist Biological Systems Engineering
Vadas, Peter: Professor, Ph.D., U.S. Dairy Forage Research Center
Zhu, Jun Yong: Professor, Ph.D., Forestry

EMERITUS FACULTY
Bubenzer, Gary D.  Holmes, Brian
Buelow, Frederick H.  Koege, Richard G.
Chapman, Larry  Massie, Leonard R.
Converse, James C.  Peterson, James O.
Cramer, Calvin O.  Rowell, Roger M.
Denes, Ferencz S.  Schuler, Ronald T.
Finner, Marshall F.  Walsh, Patrick
**Academic Staff**
Contresras-Govea, Francisco: Outreach Specialist  
Cronin, Keith: Assistant Researcher  
Janish, Vicki: Senior Outreach Specialist, AgrAbility of Wisconsin  
Lee, Joshua: Assistant Faculty Associate  
Lin, Hailin: Visiting Associate Professor with Sundaram Gunasekaran, Ph.D.  
Lu, Fachuang: Associate Scientist with Xuejun Pan  
Nelson, Jeffrey W.: Senior Research Specialist (IT Dept.)/Lecturer (Farm Equip. & Power) M.S.  
Newenhouse, Astrid C.: Associate Scientist, Ph.D., Healthy Farmers/Healthy Profits Project  
Panuska, John C.: Distinguished Faculty Associate, Ph.D.  
Sanford, Scott A.: Senior Outreach Specialist, Rural Energy Program with Doug Reinemann  
Skjolaas, Cheryl A.: Senior Outreach Specialist, UW Center for Agricultural Safety & Health  
Stenjem, Ryan: Research Specialist  
Zopp, Zack: Assistant Researcher

**Technical Personnel**
Bohne, Harold M.: Senior Instrument Maker  
Brooks, Bradley A.: Instrumentation Specialist  
Freide, Joshua: Associate Instrument Specialist

**Office Personnel**
Reinen, Sue: Department Administrator  
Wall, Jeremy: Financial Specialist  
Spahn, Pam: Payroll and Benefits Specialist  
Sumwalt, Debra K.: Student Services Coordinator  
Grochowski, Andrew: Student Worker  
Shinners, Dana: Student Worker  
Gerbitz, Hannah: Student Worker  
Sanford, Jennifer: Student Worker

**Research Associates**
Anthony, Renil (Runge/Anex)  
Fan, Yongming (Pan)  
Necpalova, Magdalena (Anex)  
Seenivasan, Rajesh (Gunasekaran)  
Sundramoorthy, Ashok Kumar (Gunasekaran)  
Yang, Qiang (Runge)  
Yoo, Chang Geun (Pan)
**Master’s Students**

Accola, Joshua: MS (Thompson, Anita)
Bradley, Alysa M.: MS (Larson, Rebecca)
Deines, Nickolas F.: MS (Larson, Rebecca)
Dietsche, Scott C.: MS (Shinners, Kevin)
Francis Clar, Jordi T.: MS (Anex, Robert)
Gu, Lei: MS (Anex, Robert)
Gunawardhana, Thilina L.: MS (Anex, Robert)
Holly, Michael A.: MS (Larson, Rebecca)
Jordan, Kari: MS (Gunasekaran, Sundaram)
Karlen, Jacob D.: MS (Shinners, Kevin)
Krantz, Sarah M.: MS (Runge, Troy)
Li, Ao: MS (Anex, Robert)
Mei, Chaoqun: MS (Pan, Xuejun)
Nigon, Brandon J.: MS (Shinners, Kevin)
Orrick, Justin D.: MS (Shinners, Kevin)
Polich, Michael J.: MS (Thompson, Anita)
Sanford, Joseph R.: MS (Larson, Rebecca)
Stubbe, Ashley: MS (Shinners, Kevin)
Wei, Liping: MS (Ralph, John)
Zhang, Shuting: MS (Pan, Xuejun)

**Ph.D. Students**

Aguirre-Villegas, Horacio Andres: PHD (Larson, Rebecca)
Bashar, Rania: PHD (Karthikeyan, K.G.)
Cho, Sung Hyuk: PHD (Larson, Rebecca)
Choi, Kyeongok: PHD (Gunasekaran, Sundaram)
Drewry, Jessica: PHD (Choi, Christopher)
Guan, Jiehao: PHD (Gunasekaran, Sundaram)
Gunukula, Sampath R.: PHD (Anex, Robert)
Holly, Michael A.: PHD (Larson, Rebecca)
Holstein, Andrew: PHD (Choi, Christopher)
Lamba, Jasmeet: PHD (Thompson, Anita)
Lan, Wu: PHD (Ralph, John)
Li, Ning: PHD (Pan, Xuejun)
Liang, Yifan: PHD (Choi, Christopher)
Liu, Zong: PHD (Gunasekaran, Sundaram)
Lu, Lin: PHD (Gunasekaran, Sundaram)
Mondaca Duarte, Mario: PHD (Choi Christopher)
O’Dell, Jane: PHD (Etzel, Mark)
Ortiz Reyes, Edgardo: PHD (Anex, Robert)
Singh, Harsh: PHD (Thompson, Anita)
Sritham, Eakasit: PHD (Gunasekaran, Sundaram)
Su, Yi-Kai: PHD (Jeffries, Thomas)
Wang, Hui: PHD (Larson, Rebecca)
Wang, Yi-Cheng: PHD (Gunasekaran, Sundaram)
Xiang, Zhouyang: PHD (Runge, Troy)
Yang, Jiang: PHD (Gunasekaran, Sundaram)
Yang, Qiang: PHD (Pan, Xuejun)
You, Youngsang: PHD (Gunasekaran, Sundaram)
Zhong, Shengfei: PHD (Runge, Troy)
Teaching

One part of the department's mission is undergraduate and graduate education. The department is responsible for:

- Undergraduate Major – Biological Systems Engineering
- Graduate Program:
  - Master of Science - Biological Systems Engineering
  - Doctor of Philosophy - Biological Systems Engineering
- Technical/Service Courses
- Farm and Industry Short Courses
- College of Agricultural and Life Sciences
- Student Advising

Biological Systems Engineering

Currently there are more than 150 undergraduate majors in Biological Systems Engineering. The major consists of a core of courses taken by all students and four emphasis areas of which students choose one: machinery systems; structural engineering systems; natural resources and environment; food and bioprocess engineering. The food and bioprocess emphasis area is spit into a food engineering track and a bioprocess engineering track. The following courses are dedicated to the Biological Systems Engineering major.

- Surveying Fundamentals (1 cr)
- Engineering Principles for Biological Systems (3 cr)
- Introduction to Computer Aided Design (3 cr)
- Structural Design for Agricultural Facilities (3 cr)
- Sustainable Residential Construction (3 cr)
- Engineering Properties of Food and Biological Materials (3 cr)
- Measurements and Instrumentation for Biological Systems (3 cr)
- Renewable Energy Systems (3 cr)
- On-Site Waste Water Treatment and Dispersal (2 cr)
- Quantitative Techniques for Biological Systems (3 cr)
- Career Management for Engineers (1 cr)
- Rheology of Foods and Biomaterials (3 cr)
- Heat and Mass Transfer in Biological Systems (3 cr)
- Sediment and Bio-Nutrient Engineering and Management (3 cr)
- Irrigation and Drainage Systems Design (2 cr)
- Biorefining: Energy and Products from Renewable Resources (3 cr)
- Food and Bioprocessing Operations (3 cr)
- Engineering Principles of Agricultural Machinery (3 cr)
- Engineering Principles of Off-Road Vehicles (3 cr)
- Biological Systems Engineering Design Practicum I (2 cr)
- Biological Systems Engineering Design Practicum II (3 cr)
- Small Watershed Engineering (3 cr)
**Curriculum**

The curriculum consists of 125 credits. Our undergraduate program was evaluated in 2012 and accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org) for another six years (the maximum allowable) as a Biological Engineering program. We are the only such accredited program in Wisconsin. Approximately 40 students earn B.S. degrees each year.

**Technical/Service Courses**

The department provides several service courses for other majors.

- Milking Machines (1 cr)
- Integral Ecology (1-3 cr)
- Advanced Life Cycle Assessment Methods (3 cr)
- Operating and Management Principles of Agricultural Machines (3 cr)
- Operating and Management Principles of Off-Road Vehicles (3 cr)

**Farm and Industry Short Course Program**

The department teaches the following courses for the Farm and Industry Short Course (FISC) program offered through the College of Agricultural and Life Sciences.

- Agricultural Safety and Health
- Agricultural Energy-Management
- Farm Machinery
- Farm Power
- Introduction to Precision Agriculture
- Livestock Housing

**Graduate Programs**

Each year about 45 graduate students are pursuing a Master of Science or Doctor of Philosophy degree in Biological Systems Engineering. In addition, our faculty advises several graduate-level students in other departments and in the programs of Water Resources Management and Land Resources Management of the Institute for Environmental Studies. The M.S. degree requires a minimum of 18 credits of course work and 6 credits of thesis work. A Ph.D. requires a minimum of 42-54 credits of course work and 24 credits of thesis work for a minimum of 66-78 credits beyond a B.S. degree in Biological Systems Engineering. Students who have bachelor's degrees in non-engineering fields may pursue a Master's degree in Biological Systems Engineering but must complete appropriate prerequisites.
Core Faculty Activity Reports

Robert Anex
Professor, Ph.D.
60% Research / 40% Teaching
Bioprocess, Systems Analysis, and Life-Cycle Assessment

Dr. Anex's research is focused on developing and assessing systems for producing energy, fuels and products from biorenewable resources. For example, Dr. Anex's research group is studying economic and environmental feasibility of biorenewable chemicals being developed in the Engineering Research Center for Biorenewable Chemicals (CBiRC), nutrient recovery and cycling in biofuel systems, and impacts of biomass production on the hydrologic cycle. Dr. Anex's research combines process development in the laboratory with large-scale model-based assessment of agricultural-industrial systems. Key tools used to evaluate the economic efficiency and environmental sustainability of biobased products are Life Cycle Assessment (LCA) and Techno-economic Analysis (TEA). Dr. Anex and his students have been working to improve LCA and TEA methods to address the unique ways that biorenewable products couple agricultural and industrial systems.

Teaching:
Spring 2013:
- BSE 309: 2 Credits, 6 Enrolled
- BSE 349: 3 Credits, 59 Enrolled
- BSE 990: Various Research Credits, 7 Enrolled
Fall 2013:
- BSE 509: 2 Credits, 6 Enrolled
- BSE 990: Various Research Credits, 6 Enrolled

Graduate Student Advisees:
Francis Clar, Jordi (Master's Degree)
Gu, Lei (Master's Degree)
Genawardhana, Thilina (Master's Degree)
Gunukula, Sampath (Ph.D. Student)
Li, Ao (Master's Degree)
Ortiz Reyes, Edgardo (Ph.D. Student)

Research:
1) Cost-Effective Soil Nitrous Oxide Emission Monitoring. Funded by the National Institute of Food and Agriculture (NIFA) and Hatch Program funds. Collaboration with Tim Parkin and USDA-ARS National Laboratory for Agriculture and the Environment.
2) Dried Distiller Grain Based Polymer Dispersions for Paper Coatings. Funded by the USDA National Institute of Food and Agriculture and Critical Agricultural Materials Program.
4) Biofuels and the Hydrologic Cycle. Funded by the National Science Foundation. Collaboration with Iowa State University. This project was featured on the radio program “Living on Earth” on August 19, 2011 in a segment titled “The future of biofuels and the weather”. The program can be found here: http://www.loe.org/shows/shows.html?programID=11-P13-00033
5) NSF-Engineering Research Center for Biorenewable Chemicals (CBiRC). Funded by the National Science Foundation. Collaboration with Iowa State University (lead institution), Rice University, University of California – Irvine, University of New Mexico, University of Virginia, Salk Institute, University of Michigan, Abo Akademi University (Finland), Eindhoven University of Technology (Netherlands), Fritz Haber Institute, Max Planck Society, and Technical University of Denmark.
6) A regional program for production of multiple agricultural feedstocks and processing to biofuels and biobased chemicals. Funded by
USDA-NIFA-AFRI Coordinated Agriculture Project (CAP). Collaboration with Louisiana State University AgCenter (lead institution), Southern University, Texas A&M University, University of Arkansas at Monticello, Danisco Inc. and Virent Inc.

7) Biofuel Cropping Systems for Feedstock Production and Greenhouse Gas Mitigation. Funded by the USDA-NIFA. Collaboration from Iowa State University (lead institution).

8) Climate Change, Mitigation, and Adaptation in Corn Based Cropping Systems. Funded by USDA-NIFA Coordinated Agriculture Project (CAP). Collaboration with Iowa State University (lead institution), Lincoln University, Michigan State University, The Ohio State University, Purdue University, University of Illinois, University of Minnesota, University of Missouri, University of Wisconsin, USDA Agricultural Research Service – Columbus, Ohio, South Dakota State University, and USDA National Institute of Food and Agriculture (USDA-NIFA).


Publications:


David Bohnhoff
Professor, Ph.D.
50% Teaching / 50% Research
Structural and Building Construction Engineering

My program falls into three primary areas: (1) structural design of post-frame buildings, (2) building environment control, and (3) appropriate technologies for sustainable farming enterprises.

Work associated with the structural design of post-frame buildings falls into three primary categories: development of new analysis techniques, development and evaluation of new structural components, and dissemination of knowledge via development and interpretation of national standards and rewriting of the NFBA Post Frame Building Design Manual. New analysis techniques that I have recently developed include (1) modeling the behavior and predicting the lateral load resisting capacity of soil surrounding an embedded post/pier, and (2) assignment of allowable design values for axial tension, axial compression and weak axis bending of mechanically-laminated wood assemblies. New structural components designed in 2013 include a high moment connection for attaching wood posts to concrete, and a unique floor suspension system that eliminates interior support columns. Considerable time in 2013 was dedicated to rewriting of the NFBA Post Frame Building Design Manual (a project that should be completed in 2014), and explaining provisions of the new ASABE engineering practice governing the design of shallow post and pier foundations.

Research on building environment control in 2013 was largely centered around three projects: construction of a rotatable guarded hot box, numerical analysis of the impact of convective currents on the performance of post-frame thermal envelopes, and evaluation of an efficient and economical heat recovery ventilator for agricultural buildings.

Research on appropriate technologies for sustainable farming enterprises has many different facets with a variety of end users/interested parties. Specific needs have been identified by UW-Extension agents. The UW-Madison Center for Integrated Agricultural Systems, and via direct contact with farmers. Much of the actual research and development work has involved undergraduate students. Work in 2013 involved fabrication and testing of a hazelnut husker, separator and sorter; design of a refrigerated trailer for the storage, transport and display of fresh produce; design of a batch barrel washer for produce (primarily root crops), conversion of an Allis G to an electric tractor for field research; investigation of trellis systems for growing organic hops, and design of a portable hoop house for fruit and vegetable production.

Teaching:
BSE 309: 2 Credits, 46 Enrolled
BSE 351: 3 Credits, 12 Enrolled
BSE 356: 3 Credits, 37 Enrolled
INTEREGR 160: 1 Credit, 31 Enrolled
BSE 509: Senior Design Faculty Advisors for 3 Teams

1) Storage, Transport, and Display Trailer for Fresh Produce (Placed 4th in 2013 AGCO Student Design Hops Competition)
2) Barrel Washer for Root Crops
3) Hops Trellis Design

Graduate Students Advised:
Andy Holstein (Ph.D. Student)
Jonathan Styx (Master’s Degree)

Extension/Outreach Activities
1) Hazelnut Processing. This work is an extension of activities associated with the Upper Midwest Hazelnut Development Initiative headed by UW Extension Agent Jason Fischbach. In 2013, I completed a second prototype of a machine for husking, cleaning and sorting hazelnuts. Worked with Rutgers and Oregon State University to establish the first major trial planting of EFB disease resistant OSU hazel cultivars in WI.
2) Growing and Processing Hops and Barley. My work in this area is in support of efforts spearheaded by Vernon County extension agent Tim Rehbein and Buffalo County extension agent Carl Dooley. Current work involves the analysis and design of trellis systems for organic hop production.

3) Wisconsin Frame Builders Association. Serve as WFBA advisor. Attended WFBA board meetings and assisted in planning of activities such as the annual tour and conference.

Research:


2) Structural Design of Hoop Houses. Made WFBA and ASABE presentations on an insulated wood foundation for hoop houses. ASABE paper was accompanied by a paper on the subject. Recently designed unique portable hoop house for use at WMARS. Construction of hoop house with wood foundation funded in part by $6000 USDA grant.

3) Evaluation and Optimization of Post-Frame Thermal Envelopes. Continued work with graduate student Holstein on a rotatable guarded hot box. Federal Hatch for 3 months at $43,000/yr. BSE Department for 9 months at ~$36,000/yr.

4) Development of Small-Scale Storage Facilities For Winter Storage of Fresh Produce. Supports Scott Sanford work. SARE Grant through University Of Minnesota. $36,000/yr.

5) Development of Sustainable Post-Frame Building System. Worked with Holstein on submittal of ASCE and ASABE journal articles for this recently completed Hatch supported project.

6) Sustainable Air Conditioning Systems For Plant Growth, Animal Growth And Food Storage Facilities. Worked with graduate student Styx on the development of a low-cost, high volume, heat exchanger for high-moisture environments. Project was completed for Styx’s M.S. degree. Project funded with money from EPD professional development courses.

7) Moment Resisting Post-to-Concrete Connection. Designed, fabricated and installed (for field testing) a new post-to-concrete pier connection with high bending strength in 2013. Personally funded. Working to secure funds for laboratory testing.

Peer-Reviewed Journal Articles


Books & Chapters


Conference Proceedings, Technical Papers/Reports


Abstracts, Posters, Presentations
1) Post Frame Research Update, WFBA Annual Meeting, January 16, 2013 (Invited Presentation)
3) Overview of Revisions to the Shallow Post Foundation Standard, Frame Building Expo, Memphis, TN, February 21, 2013 (Invited Presentation)
7) Fundamentals of Building Design, EPD Course for Building Inspectors, Milwaukee, WI October 8, 2013 and again on October 9, 2013

Professional Development Activities
1) Wisconsin Frame Builders Annual Tour and Conference, January 15 and 16, 2013, Warrens, WI
2) NFBA Frame Building Expo, February 20-21, 2013, Memphis, TN
4) Upper Midwest Hazelnut Growers Conference, March 1-2, 2013, Eau Claire, WI
5) ASABE Section Meetings, March 27, May 21 and October 2
6) ASABE Annual International Meeting, July 21-24, 2013, Kansas City, MO

Professional Service
1) Profession (ASABE/other)
   i. American Society of Agricultural and Biological Engineers
      • Structures and Environment Standards Committee, SE-03
   ii. Structures Committee, SE-20
   iii. Agri-Industrial Facility Design and Operation Committee, SE-07/1
   iii. Evelyn E. Rosentreter Standards Award Committee, M-160
   iv. Mechanically Laminated Columns working group, X559
   v. Wisconsin Section – Attended 2 section meetings in 2013 and printed student awards
      • Manuscript reviewer
   ii. National Frame Builders Association
      • NFBA T&R Committee. Attended four meetings in Chicago in 2013
      • Answer numerous technical questions via phone and e-mail on behalf of NFBA

2) College/Campus/University
   i. Interdivisional Curriculum Committee (5 hours per month)
   ii. College of Engineering Academic Planning, Curriculum, and Regulations Council (CoE APCRC) (1.5 hr per month)
   iii. Advisory Committee for International Engineering Certificate
   iv. BSE Undergraduate Instruction and Program Committee Chair (3 - 4 days per month)
      • Provided overview of BSE program to at least 60 students in 2013. Included many meetings and tours involving parents and potential transfers from outside the university
      • Averaged approximately 45 assigned undergraduate student throughout 2013
      • Provided help/assistance to numerous other BSE students with unique questions regarding study abroad, internships, course substitutions, and graduation requirements
      • Shepherded new courses and course change proposals through the approval process

Awards
ASABE Standard Development Award, ASABE, July 22, 2013
Christopher Choi
Professor, Ph.D.
60% Teaching / 40% Research
Biological Heat and Mass transfer

My research program is primarily focused on computational and experimental heat and mass transfer in biological, agricultural and environmental systems. Specifically, I have initiated and conducted research on the following topics Algal Biofuel, Pathogen transport that occurs during spray irrigation of liquid manure, design and evaluation of systems for cooling dairy cows, and ground source heat exchangers.

Teaching:
Spring 2013
  BSE 309: 2 Credits, 46 Enrolled (team taught)
Summer 2013
  BSE 375: 3 Credits, 10 Enrolled
Fall 2013
  BSE 375: 3 Credits, 19 Enrolled
  BSE 509: 2 Credits, Advised 1 Team
New Courses Created
  BSE 270: Introduction to Computer Aided Design (3 Credits)
  BSE 464: Heat and Mass Transfer in Biosystems (3 Credits)

Graduate Students Advised:
Jessica Drewry (Ph.D. Student)
Matthew Harper (Master’s Degree)
Andrew Holstein (Ph.D. Student)
Yifan Liang (Ph.D. Student)
Mario Mondaca (Ph.D. Student)

Research:
1)  Optimization of Dual Conjunctive Water Supply and Reuse System. Funding from National Science Foundation ($47,292). 09/2012-08/2013
3)  Pathogen Transport during Spray Irrigation of Liquid Manure. Funding from WI DNR ($140,000). Collaboration with Rebecca Larson and Mark Borchardt. 07/2013-06/2014
4)  Online CAD Course Development for Engineers. Funding from UW CALS and Continuing Studies ($20,000). Collaboration with Kim Manner. 09/2012-08/2014

5)  Cooling Dairy Cows with Impinging Jets. Funding from USDA-Hatch ($80,000). 03/2014-02/2016 Pending Approval

Peer-Reviewed Journal Articles
Patents

Conference Proceedings

Professional Services
1) Department
   a) BSE Information Technology Committee, Chair (2012-present)
   b) BSE Advancement Committee (2012-2013)
2) College/Campus/University
   a) CALS Facilities Committee (2013-present)
   b) Dissertation/Thesis Committee, Member
      i) John Reimier, PhD student in Civil and Environmental Engineering, in progress
      ii) Adam Bechle, PhD student in Civil and Environmental Engineering, in progress
      iii) Ayse Ozbek, PhD student in Geological Engineering, in progress
      iv) Sanghwa Lee, PhD student in Civil and Environmental Engineering, in progress
3) Profession
   a) Associate Editor, Transactions of the ASABE and Applied Engineering in Agriculture (2011-present)
   b) Session Organizer and Program Chair: Computational Fluid Dynamics (CFD) Applications in Agriculture, 2013 ASABE Annual International Meeting, Kansas City, MO.
   c) Session Organizer and Program Chair: The SMART Water Grid International Conference 2013, Incheon, Korea (Invited).
   d) Member of ASAE/ASABE’s committees. IET-254 Emerging Information Systems, IET-217 (Computational Methods, Simulations, and Applications), and Representative of IET for PM5 (Publications Review).
   e) Vice Chair of ASABE IET-217 (Elected)
   f) Founding Member and Vice President of ASABE AKABE (Association of Korean Agricultural, Biological and Food Engineers, 2012-Present)
   g) Reviewer – Refereed Journals
      i) Transactions of the ASABE
      ii) Applied Engineering in Agriculture
      iii) Journal of Hydro-Environment Research
      iv) Journal of Phycology
      v) Journal of Hydroinfomatic
Sundaram Gunasekaran
Professor, Ph.D.
50% Teaching / 50% Research
Food Engineering

My primary interests are in the area of engineering properties of food and biomaterials with special emphasis on rheological properties. We study and characterize food gels and other macromolecular systems in order to better understand their structure function relations and to engineer value-added food and non-food products. In the area of biopolymer gels we are investigating potential applications of preparing encapsulated microparticles and nanoparticles and controlled delivery of bioactive compounds. We also investigate heat and mass transfer and related unit operations in food and biprocessing. In the area of instrumentation and sensors we focus on nondestructive evaluation of properties and quality of food materials and development of biosensors for measuring certain allergens and toxins. Please see our web page for more information: www.foodeng.wisc.edu.

Recent research is focused on synthesis and use of nanomaterials (gold nanoparticles, carbon nanotubes, graphene, etc.) and electrochemistry for biosensing and other novel applications. Efforts are underway to develop visible detection of pathogenic organisms in environmental water as well as in foods. Electrochemical methods are used to detect toxins, heavy metal, and other contaminants in foods and in environmental water. In situ green synthesis of nanomaterials is being pursued to develop these nanoreactors as visible indicators of food quality and safety. Adapting some of the biosensing techniques to detect circulating tumor cells is a new development, which is being pursued in collaboration with a faculty colleague in the School of Medicine. In addition, collaboration with a faculty colleague in Biochemistry is aimed at developing a biofuel cell.

Teaching:
BSE 309: Advisor of One Design Team
BSE 509: Advisor of One Design Team
BSE 365: 3 Credits, 38 Enrolled
BSE 441: 3 Credits, 19 Enrolled
BSE 900: 1 Credit, 12 Enrolled
BSE 901: 1 Credit, 12 Enrolled
BSE 990: Thesis Research

Advising:
Graduate Students:
Jiehao Guan (Master’s Degree)
Kari Jordan (Master’s Degree)
Zong Liu (Ph.D. Student)
Lin Lu (Ph.D. Student)
Yi-Chang Wang (Ph.D. Student)
Youngsang You (Ph.D. Student)
Post-Docs/Visiting Scholars
Rajesh Seenivasan
Ashok Sundramoorthy
Nael Yasri
Dilek Cokeliler
Pelin Onsekizoglu
Chitradurga Mohan

Research:
1) Electrochemical Biosensors to Detect Toxins in Complex Food Matrices, Hatch 2012-2015 ($216,132)
2) In Situ Synthesis of Gold Nanoparticles as Novel Time Temperature Indicator for Food Quality Monitoring, Hatch, 2010-2014 ($188,047)
3) Novel Applications for Biopolymers, SoilNet LLC, 2011-2013 ($86,640)
5) Rapid and Visible Detection of Indicator Organisms, WARF, 2013-14 ($92,354)
6) Paper-fluidic Electrochemical Sensor for Heavy Metal Detection, AO Smith, 2013-14 ($31,294)
7) Determining Microbial Quality of Water, Sanigen, 2013-14 ($20,000)

Peer-Reviewed Journal Articles


Books and Chapters


Patents


Conference Proceedings, Technical Papers/Reports


Abstracts, Posters, and Oral Presentations

Professional Service
1) University: Kemper-Knapp Bequest Committee (Chair)
2) CALS: Station Representative: NC213, Marketing and delivery of Quality Cereals and Oilseeds; NC1023, Engineering for food safety and quality, S-1007, The Science and Engineering for a Biobased Industry and Economy (Secretary; Vice-Chair; and Chair, 2006); NCDC 201 Nanotechnology and Biosensors.
3) COE: Engineers Day Committee
4) Department: Undergraduate Instruction Committee; Graduate Research and Instruction Committee (Chair)
5) Other: Evaluator for promotion/tenure dossiers and international PhD theses and Reviewer for various Peer-review journals

Awards
1) Fulbright Program Specialist, 2012-13
2) WARF Challenge Grant Award, 2013
David Kammel
Professor, Ph.D.
78% Extension / 22% Research
Agricultural Building Design

The majority of my work is in dairy modernization efforts. This includes programming and coordinating programs in dairy facilities and feeding systems including low cost milking centers, free stall barns, special needs and transition cow barns, and TMR feeding equipment. Much of this work has been with family dairy farms in transition from 60 cows in a tie stall barn to parlor freestall system. This work has been accomplished through the Dairy Modernization workgroup of the Dairy Team which I co-chair. I was also co-chair of the Dairy Theme tent in Farm Progress Days 2013 and am co-chair of the Educational Committee for Farm Technology Days 2014.

Teaching:
Fall 2013
BSE 95: FISC Livestock Housing, 3 Credits, 29 Enrolled

Extension/Outreach Activities
Dairy Modernization Programs. The Dairy Modernization Extension Program has an established recognition with Wisconsin county agents and producers. It has also garnered attention from other states such as Minnesota, Iowa, Illinois, Pennsylvania, New York, and Maine. The majority of my work year has been through producer and agent requests to develop and deliver topics in that area. This includes presenting and coordinating programs in dairy housing facilities and feeding systems including low cost milking centers, free stall barns, compost bedded barns, special needs and transition cow barns, and calf heifer housing. I had over 3200 contacts via email or phone for requests for information, and spoke to over 500 participants in extension meetings. I worked in 24 counties with 22 different agents on client requested farm visits developing plans and educational materials to approximately 100 individual farms. Much of this work has been with family owned dairy farms growing through the transition from 60-100 cows in a tie stall barn into newer milking parlor and freestall or bedded pen housing systems and calf and heifer housing systems. New requests include integrating technology such as automatic milking systems and calf feeding systems into existing and new facility design has become more common. I have also worked with dairy goat/sheep farms as they develop their new farmsteads and point of sale operations. Requests for dairy and beef cattle handling systems are also popular. This work has been accomplished through the Dairy Modernization workgroup of the Dairy Team which I am co-chair, and the Livestock team. Green County and Pierce County had dairy facility tours with tour participants selected from farm that the agents and I had worked with earlier on their new facility designs.

Meetings and Activities:
1) 2013 WFBA Conference and Tour, Warrens, WI
2) FISC Pasture Management class
3) FTD 2013 Barron county, Wisconsin Ideal maternity Pen
4) Pepin County Farm management Club Tour
5) Dairy Modernization Tour, Pierce St. Croix County
6) Dairy Modernization Tour, Green Counties
7) River Falls Beef Cattle handling Center Design
8) Babcock Training Germany, Belarus
9) International Visitors tour host for Finland, Germany, Belarus, Russia, Japan, Argentina
10) Southern States Advanced Ruminant Cattle Feedmaster Program Knoxville, TN
11) Green County area Dairy management Seminar
12) Union Bank Green County Dairy Tour
Extension Publications
1) Wisconsin Ideal Calf Pen Fact Sheet, UWEX

Book Chapters (peer-reviewed)

Presentations Developed
1) Dairy Modernization
2) Designing Large Dairy Farms
3) Cow Comfort Design
4) Retrofitting AMS into Existing Facilities
5) Group Housing and Management of Calves
6) Ventilation of Calf Housing
7) Dairy Housing Design and Management
8) Dairy Farmstead Master Planning
9) Transition Cow Housing and Design and Management

Professional Development Activities
1) Sabbatical Spring 2013

Professional Service
1) 4 State Dairy Extension Planning Committee
2) BSE Departmental Extension, and Social Committee
3) Animal Husbandry Planning Committee
4) Phi Kappa Phi Honor Society
5) Gamma Sigma Delta Honor Society
6) Alpha Epsilon Honor Society
7) ASABE member 28 years
K.G. Karthikeyan
Professor, Ph.D.
50% Teaching / 50% Research
Natural Resources and Environment

Professor Karthikeyan’s Fields of Interest include: fate, removal, and transport of nutrients and contaminants in surface/subsurface environments; water quality chemistry; land application of agricultural/municipal/industrial waste; applications of GIS/water quality models; physical and chemical processes for water, wastewater, and waste treatment; and soil decontamination.

Teaching:
Spring 2013
  BSE 472: 3 Credits, 16 enrolled
  BSE 571: 3 Credits, 13 Enrolled
Fall 2013
  BSE 372: 2 Credits, 29 Enrolled
  BSE 509: 3 Credits, 39 Enrolled
  BSE 671: 1-3 Credits, 10 Enrolled

Graduate Students Advised:
Josh Accola (Master’s Degree)
Rania Bashar (Ph.D. Student)
Linchen Han (Ph.D. Student)
Jasmeet Lamba (Ph.D. Student)
Elizabeth Miller (Ph.D. Student)
Sara Nason (Ph. D. Student)
Michael Polich (Master’s Degree)

Research:
6) “Implications of Phosphorus Recovery from Wastewater for Biosolids Management.” USDA-NIFA Hatch. $183,228 [PI: K.G. Karthikeyan]. 10/1/12 to 9/30/16.

Peer-Reviewed Journal Articles


Abstracts, Posters, and Oral Presentations

1) ASAE Annual Meeting, Kansas City MO, 2013 - 2 presentations
2) AWRA Spring Specialty Conference - Agricultural Hydrology and Water Quality, St. Louis MO, 2013 – 1 presentation
3) AWRA Wisconsin Section Conference, Brookfield WI, 2013 – 2 presentations
4) Annual ASA-SSSA-CSSA Tri-societies Meeting, Tampa FL, 2013 – 1 presentation

Professional Service

1) University of Wisconsin-Madison:
   a) Member, Physical Sciences Divisional Executive Committee (2012-2015)
   b) Affiliate faculty, Environmental Chemistry and Technology Program
   c) Affiliate faculty, Department of Civil & Environmental Engineering (at UW-Madison and Carnegie Mellon University, Pittsburgh PA)
   d) Affiliate faculty, The Nelson Institute for Environmental Studies (IES)

2) UW-Madison Biological Systems Engineering Department:
   a) Awards Committee (Chair, since fall 2012)
   b) Graduate Instruction and Research
   c) Undergraduate Instruction and Program

3) Regional Committees:
   a) SERA-17 (Organization to Minimize Phosphorus Losses from Agriculture)
   b) W-2082 (Evaluating the Physical and Biological Availability of Pesticides and Pharmaceuticals in Agricultural Ecosystems)

4) ASABE Committees:
   a) Member: SE-412 (Agricultural Waste Management); SW-21 (Hydrology); SW-224 (Pollution by Sediment); BE-24 (Soil and Groundwater Remediation)

5) Review Committees:
   a) Associate Editor: Journal of Environmental Quality
   b) Panelist: USDA-Agriculture and Food Research Initiative Competitive Grants Program (AFICGP) (2013)
The biowaste research team lead by Dr. Larson in the BSE department continues to investigate multiple areas of manure management systems including measuring greenhouse gas emissions, developing a manure based life cycle assessment, examining nutrient runoff from silage storage and feedlots, building and evaluating tile drainage treatment systems, evaluating manure storage systems and agitation practices, evaluating solid/liquid separation technologies, surveying producers to determine manure management practices in Wisconsin, examining the effects of biochar on nutrient management, and evaluating full and laboratory scale anaerobic digestion systems to improve biogas production (among others). All research conducted is integrated into tools and educational programming for use in extension arenas across the country. This information is critical in developing manure management and operational recommendations for producers that promote environmental and economic sustainability. This information is also crucial to those making decisions on manure based regulation and policy.

**Teaching:**

ES 360 – Domestic and International Dimensions of Renewable Energy

Faculty advisor duties for this course include presentations during class time and a weekly meeting with the students traveling to Uganda for renewable energy project implementation. Class includes travel to Uganda for 2 weeks (with 5 undergraduates and 3 graduate students) to install a digester and further develop international use of renewable energy systems. Weekly meeting duties include meeting with design teams, working with students to identify critical resources and to develop brainstorming techniques, reviewing and evaluating all weekly oral presentations, advising team on technical aspects of digestion, and overseeing technical components in Uganda.

Manure Management & Lab Instruction for Biological Systems Engineering; Livestock Housing Short Course

**Extension**

2013 Midwest Manure Summit: Co-chaired the planning committee to develop a well-attended farmstead manure conference with approximately 200 attendees. The conference attracted numerous stakeholders including producers, industry, and government. The content of the conference was well received and included a variety of manure experts from around the country providing information on many topics relevant in Wisconsin from energy production to nutrient control. The program will be held again in 2015.

Manure Irrigation Workgroup: Developed a manure irrigation workgroup in response to the issues associated with the use of irrigation systems to land apply manure in Wisconsin. Presented well attended workshops around the state to address concerns with this issue and provide current scientific based information on the topic. The coordinated through UW Extension has also produced a website explaining the issues/practices at http://fyi.uwex.edu/manureirrigation/. In connection I have lead a research group to investigate areas with little knowledge to guide the workgroup in making sound decisions with respect to this practice.

**Funded extension/outreach projects:**

USDA, North Central Regional Center for Rural Development funded project: Improved information transfer to assist farmers in rural Michigan and Wisconsin in making informed decisions about on-farm small scale anaerobic digesters
External Stakeholder Evaluation: All evaluations were extremely positive in terms of educational programming (including providing leadership, responding to needs, and providing scientific based information). Other feedback to improve on is to reduce workload to improve response time and to increase workshops for anaerobic digesters around the state.

Advising:
Graduate Students:
Horacio Aguirre-Villegas (Ph.D. Biological Systems Engineering; Co-Advisor with D. Reinemann, May 2014)
Nickolas Deines (M.S. Biological Systems Engineering, Summer 2014)
Alysa Bradley (M.S. Biological Systems Engineering, Summer 2014 – to stay on for PhD)
Hui Wang (Ph.D. Biological Systems Engineering, December 2015)
Joseph Sanford (M.S. Biological Systems Engineering, May 2015)
Michael Holly (M.S. in Biological Systems Engineering, July 2013)
Michael Holly (Ph.D. Biological Systems Engineering, May 2016)
Post-Doctoral:
Dr. Sasikumar Elumalai (Post-Doctoral)

Research:
1) Small Scale Anaerobic Digester Research at the Institute for Environmentally Integrated Dairy Management Located at the UW-Madison Marshfield Agricultural Research Station: USDA NIFA
2) Silage Leachate: Water Quality Assessment and Treatment: Wisconsin Groundwater Coordinating Council
3) AFRI Sustainable Bioenergy CAP: Dairy Systems
4) Evaluating and Parameterizing Models to Assess Sediment and Phosphorus Loads from Cattle Exercise Lots in the Six-Mile Creek Adaptive Management Pilot Study Area: WDNR
5) Assessment of Manure Storage Processing and Handling on Nutrient and Solids Content: WI Fertilizer Research Council/ DATCP
6) Monitoring Sediment and Phosphorus Loads in Runoff from Dairy Feedlot/Exercise Lots to Facilitate Model Parameterization: WDNR
7) Pathogen Transport During Manure Irrigation
8) QMRA of Manure Irrigation Pathogen Transport
9) Impact assessment of anaerobic digestion: economic, environmental, and operational relationships: WDNR
10) Biochar/Manure as an Amendment for Improved Soil and Water Quality: Hatch/WISA
11) Treatment of Effluent from Agricultural Fields with Subsurface Tile Drains with an In-line Treatment System: Hatch
12) Discovery Farms/WDNR: Silage Runoff

Peer-Reviewed Journal Articles

Extension Publications

Conference Proceedings, Technical Papers/Reports


Abstracts, Posters, and Oral Presentations (Sample of 2013):


Professional Service:

Department Committee Membership
Extension Committee Member, Fall 2010-Present
Pre-Professional Group Advisor, Fall 2011-Present
Social Committee, Fall 2010-Present
Undergraduate Instruction and Curriculum Committee, Fall 2012 - Present

College/Campus/University
Consult with CALS Arlington Agricultural Research Station – Struvite and solids removal in swine manure handling system
Member of NRCS Technical Committee reviewing WI NRCS 629 Code of Standards, Waste Treatment
Member of DNR Technical Committee developing standards for Spray Irrigation

UWEX Dairy Team
UWEX Nutrient Management Team
UWEX Bio-energy/Bio-economy Team

Profession (ASABE/other)
American Society of Biological and Agricultural Engineers

SE-412/SW-263 Committee Member; 2012 Secretary, 2013 Vice-Chair

Air and Waste Management Association
Midwest Renewable Energy Association

Livestock and Poultry Environmental Learning Center
Professional Nutrient Applicators Association of Wisconsin

NIMSS: NCCC-9
NIMSS: S-1032
Xuejun Pan
Associate Professor, Ph.D.
50% Teaching / 50% Research
Bioenergy and Bio-Products Engineering

Dr. Pan’s research is focused on developing innovative biorefining processes for producing energy, fuels, chemicals, and materials from renewable resources. Some specific research interests of Dr. Pan are pretreatment and fractionation of lignocellulosic biomass for bioconversion, chemical and enzymatic saccharification of lignocellulose, catalytic conversion of lignocellulose to drop-in hydrocarbon fuel, and value-added utilization of cellulose, lignin, hemicellulose and extractives.

Teaching:
Spring 2013:
  BSE 309: 3 Enrolled
Fall 2013:
  BSE 364: 3 Credits, 55 Enrolled
  BSE 460: 3 Credits, 12 Enrolled
  BSE 509: 3 Students under my Advice
  BSE 699: 3 Credit, 1 Enrolled
  BSE 799: 3 Credit, 1 Enrolled
  BSE 990: Thesis Research

Advising & Mentoring:
Graduate Students Advised:
  Chaoqun Mei (Master’s Degree)
  Ning Li (Ph.D. Student)
  Qiang Yang (Ph.D. Student)
  Shuting Zhang (Master’s Degree)
Mentoring:
  Dr. Chang Guen Yoo (Postdoc)
  Dr. Yongmeng Fan (Visiting Professor, Beijing Forestry University, China)

Research:
3) NSF (National Science Foundation) (CBET 1159561) Xuejun Pan, “Fast saccharification of lignocellulosic biomass under mild conditions in the medium of concentrated lithium bromide”, $298,686 (July 2012 - June 2015)
4) WARP Accelerator Program Xuejun Pan, “Production of high-concentration sugar directly from lignocellulose under moderate conditions for fuels and chemicals”, $127,825 (May 2013 - April 2014)
5) USDA McIntire Stennis (WIS WISO1597) Xuejun Pan, “Direct saccharification and fractionation of forest biomass for fuel and chemical production under mild conditions in concentrated halide salt solution”, $162,312 (October 2011 - September 2015)

Peer-Reviewed Journal Articles

Invited Book Chapters (peer-reviewed)

Invited presentations

Oral conference presentations
3) Qiang Yang and X.J. Pan. Cellulase mimetic solid acids for hydrolysis of cellulose in water. 245 th ACS National Meeting & Exposition, April 7-11, 2013, New Orleans, LA.

Poster conference presentations
1) Chaqun Mei and X.J. Pan. Dissolution of cellulose in aqueous lithium bromide solution. 245 th ACS National Meeting & Exposition, April 7-11, 2013, New Orleans, LA.

Professional Service
1) University
   a) Graduate Instruction and research Committee (2007-Present)
   b) Undergraduate Instruction and Program Committee (2007-Present)
   c) CoE Assessment Committee (2009-Present)
   d) Involved in ABET Assessment Efforts

Civic Service
1) Editorship
   a) Associate Editor, BioEnergy Research (2013-Present)
   b) Editorial board member Journal of Biobased Materials and Bioenergy (since 2007)
   c) Editorial board member of International Journal of Agricultural and Biological Engineering (since 2008)
2) Conference Organization
   b) Fundamentals and Practice of Cell Wall Deconstruction, Cellulose Renewable Materials Division, the 245 th ACS National Meeting, New Orleans, LA, April 7-11, 2013.
3) Journal Article Reviewer
   a) ACS Sustainable Chem Eng
   b) BioEnergy Research (x2)
   c) Biomass & Bioenergy
   d) Cellulose
   e) ChemSusChem
   f) Energy & Fuels
   g) Journal of Agricultural and Food Chemistry
   h) Powder Technology
   i) Wood Chem Technol
4) Proposal Reviewer
   a) NSF Review Panel
   b) USDA NIFA SBIR Review Panel
Douglas J. Reinemann
Professor and Chairman, Ph.D.
24% Teaching / 25% Research / 51% Extension
Faculty Affiliate in Dairy Science, AgroEcology, Center for Integrated Ag Systems, Gaylord Nelson Institute for Environmental Studies, Energy Analysis and Policy Program

Dr. Reinemann has directed the activities of the UW Milking Research and Instruction lab since 1990. His research interests include the biomechanics of machine milking, milk quality assurance, and the development and deployment of robotic milking systems. As a long-time member and frequent chair of the NMC, IDF, ISO and ASABE milking machine committees, his work with international experts has been focused on the development and interpretation methods for machine milking performance indicators.

Doug has also been working at the interface between energy and agricultural systems for more than 24 years. His research and extension interests included energy use and energy production in agricultural systems. He is a member of the sustainability group of the UW Great Lakes Bioenergy Research Center examining environmental impacts of biofuels production systems. He also leads the UW ‘green cheese’ team who are investigating synergies between dairy and biofuels production systems in Wisconsin. Doug has been actively involved with the Midwest Rural Energy Council - an organization of power suppliers addressing issues related to energy supply to agricultural production and processing operations as well as integrating renewable energy resources into the energy distribution grid.

Teaching
Spring 2013
BSE 367, Renewable Energy Systems
3 Credits, 78 Enrolled
Summer 2013
BSE 367, Renewable Energy Systems
3 Credits, 21 Enrolled – (Special session for sustainable System Engineering MS program)
Fall 2013
BSE 367, Renewable Energy Systems
3 Credits, 68 Enrolled
AgroEcology/BSE 875, Integral Ecology
1-3 Credits, 5 Enrolled

Graduate Students Advised
1) Horacio A. Aguirre-Villegas, PhD 2013 BSE, Co-advised with Rebecca Larson
3) Robert Rowbotham, PhD 2015, Dairy Science, Co-advised with Pamela Ruegg

Extension / Outreach
Support UWEX agent programs in Milking Machines, Milking Parlors, Robotic Milking, Milking Management, Energy, and Bio-Energy
Outcomes 4.25 (4.18)
External Stakeholder Programs
MRIL web site and MilkTech professional development courses (International On-Line curriculum used in 4 countries)

MREC web site and annual educational conference on rural energy issues.
Stray Voltage Investigators Courses

Research
Milking Machine Research: Avon Dairy Solutions
Future Cow Automated Pre-Milking Preparation: With Pamela Ruegg
Great Lakes Bioenergy Research Center:
Sustainability Group, Life Cycle Assessment: DOE, with Paul Meier
Climate Change Mitigation and Adaptation In Dairy Production: AFRI/CAP, With Ruark, Larson, Watteaux, Bland, Benson, Jahn and Stephenson
Energy Intensity, Carbon Footprint, And Environmental Impact Of Pasture-Based Dairy, DATCP, With Victor Cabrerra
Farm-Based Bioenergy Infrastructure: Wisconsin
Focus On Energy, with Carol Barford
USDA Energy Self Assessment Website: With Scott Sanford

Publications:
Peer reviewed

Book Chapters
Reinemann, DJ, 2013. Milking Machines and Milking Parlors. Chapter 7, pp 177-198:

Conference Proceedings


Professional Development
Advanced Milking Physiology Workshop
WISELI Department Chair’s Climate Workshop
Faculty & Staff Pay Tools Workshop
Integral Theory Conference

Professional Service
BSE Undergrad Instruction committee
BSE IT committee member
Midwest Rural Energy Council, Ex-Officio
Executive Board Member and secretary
Wisconsin Association of Milk, Food, and Environmental Sanitarians member
National Mastitis Council, Milking Machine Committee
International Dairy Federation, Chair machine milking committee
American Society of Agricultural and Biological Engineers
• IET-441 Milk Handling Equipment
• IET-433 Agricultural Wiring and Electrical Energy Applications
Reviewer for Transactions ASABE, J. Dairy Science, J. Dairy Research, and several energy related journals
Troy Runge
Assistant Professor, Ph.D.
60% Research / 40% Teaching
Biomaterials, Bioenergy, Bioprocessing

Troy Runge is an Assistant Professor in the Biological Systems Engineering in CALS where he performs research and teaches in the bioenergy field. Troy is a lignocellulose chemist by training and has Pulp and Paper Science degrees including a B.S. from UW-Stevens Point and M.S. and Ph.D. degrees from the Institute of Paper Science and Technology at the Georgia Institute of Technology. Troy spent several years at UW as the Director of the Wisconsin Bioenergy Initiative, and prior to that spent fifteen years working at Kimberly-Clark Corporation in a variety of research and engineering roles for pulp, tissue, nonwoven, and hygiene product production. Troy is currently working in several aspects of bioenergy and bio-based materials with an emphasis on biomass composition and separation technologies.

### Teaching:
- BSE 249: 3 Credits, 43 Enrolled
- BSE 461: 3 Credits, 12 Enrolled

### Advising:
Graduate Students:
- Shengfei Zhou (Ph.D. Student)
- Zhouyang Xiang (Ph.D. Student)
- Zong Liu (Ph.D. Student)
- Sarah Krantz (Master’s Degree)
- Kim Pham (Master’s Degree)

Post Master’s and Post-Doctoral:
- Dr. Sasikumar Elumalai (Post-Doctoral)

### Research:
1) *Development of Affordable Bioenergy and Bioproducts Laboratories for Education.* Troy Runge*, Eric Singsaas, Tim Zauche, and Chris Baxter. Funding from USDA Higher Education Challenge Grant (2012 – 2014) $291,236. Collaboration with UW Stevens Point and UW Platteville. This educational project will create twelve laboratory bioenergy classes that are developed to be low-cost enabling any interested University to implement either as supplementation to existing classes or as a stand-alone bioenergy lab class.

2) *Accelerated Renewable Energy (ARE).* John Markley*, Tom Cox, John Norman, Jim Leverich, & Troy Runge. Funding from USDA Biomass Research and Development Initiative (2012-2016) - $7,000,000. Collaboration with Maple Leaf Dairy (Cleveland, WI), Soil Net, LLC (Madison, WI), Braun Electric, Inc. (St. Nazianz, WI), and FEEOCO International, Inc. (Green Bay, WI). The ARE project investigates a process to reduce environmental impacts of dairy manure through on-farm fractionation and processing of manure into economically valuable products that will provide cash flow to the dairy.

3) *Dried Distiller Grain Based Polymer Dispersions for Paper Coatings.* Troy Runge* & Rob Anex. Funding from USDA NIFA (2013-2016) - $499,426. Collaboration with Didion Ethanol. This project seeks to extract hemicellulose from DDG to create a replacement for petroleum based paper coatings. The project will assess the technical and economic viability along with the environmental impact.

4) *Extracting Value from Ensiled Biomass.* Funding: Hatch (2012-2014) - $77,722. This project is using a combination of a biological and chemical system to determine the economics of ensiled biomass storage for cellulosic biofuels with the added step of extracting and purifying the produced lactic acid to be utilized as value-added monomer.

5) *Amendments for Improved Soil and Water Quality.* Troy Runge* & Becky Larson. Funding from Hatch (2012-2014) - $89,674. The research investigates the use of biochar, a residual stream from pyrolysis or gasification, as a soil amendment to reduce nutrient and contaminant leaching from field-applied manure.

6) *Renewable Chemicals at Corn Ethanol Plants.* Funding from Wisconsin Corn Promotion Board (2012-2014) - $40,490. This project researches a process that fractionates DDGS into a high protein stream, and a high carbohydrate stream which is dehydrated into furfural to provide an additional revenue source for corn ethanol plants.
Peer-Reviewed Journal Articles

Conference Presentations
1) Runge, Troy; Xiang, Zhouyang; Furfural from DDG. International Bioenergy and Bioproducts Conference, Green Bay, WI (Sept. 19, 2013).
2) Runge, Troy; Elumalai, Sasikumar; Roa, Aicardo; Markley, John; Manure Fiber to Ethanol. International Bioenergy and Bioproducts Conference, Green Bay, WI (Sept. 19, 2013).
3) Runge, Troy; Xu, Xiaodong; Biomass Supply Assessment. International Bioenergy and Bioproducts Conference, Green Bay, WI (Sept. 18, 2013).
4) Runge, Troy; Heinricher, Jackie; Meier, Dan; Co-cooking Moso Bamboo with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 18, 2013).
5) Runge, Troy; Zhang, Chunhui, Co-cooking Non-woods with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 17, 2013).

Conference Proceedings, Technical Papers/Reports
17) Runge, Troy; Heinricher, Jackie; Meier, Dan; Co-cooking Moso Bamboo with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 18, 2013).
18) Runge, Troy; Zhang, Chunhui; Co-cooking Non-woods with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 17, 2013).

Patents

Conference Proceedings, Technical Papers/Reports
17) Runge, Troy; Heinricher, Jackie; Meier, Dan; Co-cooking Moso Bamboo with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 18, 2013).
18) Runge, Troy; Zhang, Chunhui; Co-cooking Non-woods with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 17, 2013).

Patents

Conference Presentations
1) Runge, Troy; Xiang, Zhouyang; Furfural from DDG. International Bioenergy and Bioproducts Conference, Green Bay, WI (Sept. 19, 2013).
2) Runge, Troy; Elumalai, Sasikumar; Roa, Aicardo; Markley, John; Manure Fiber to Ethanol. International Bioenergy and Bioproducts Conference, Green Bay, WI (Sept. 19, 2013).
4) Runge, Troy; Heinricher, Jackie; Meier, Dan; Co-cooking Moso Bamboo with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 18, 2013).
5) Runge, Troy; Zhang, Chunhui, Co-cooking Non-woods with Hardwoods. TAPPI PEERS Conference, Green Bay, WI (Sept. 17, 2013).

Professional Development
1) Represented UW at the Multi-State S1041 meeting: The Science and Engineering for a Biobased Industry and Economy conference. Maui, HI. (June 2013)
2) Attended TAPPI PEERS Conference, Green Bay, WI (September 2013).
3) Attended TAPPI International Bioenergy and Bioproducts Conference, Green Bay, WI (September 2013).
4) Reviewed “Advanced Technology for Low Cost Ethanol from Engineered Cellulosic Biomass” Project Completion for USDA – NC State (September 2013)
5) Reviewed NSF STTR grants (May 2013)

Professional Service
University
1) BSE Committees – UIIPC & Development
2) Wisconsin Energy Institute Board

Civic Service
1) Wisconsin Institute of Sustainable Technology
Advisory Board
2) Wisconsin ASABE Awards Chair
3) TAPPI Non-woods Section Secretary
4) Numerous journal article reviews
Kevin Shinners
Professor, Ph.D.
50% Teaching / 50% Research
Power and Machinery

Dr. Shinners’ interests include engineering aspects of systems to cut, dry, harvest, package, store, fractionate and process biological plant material to be used as ruminant animal feed or as a biomass feedstock for production of bio-energy and bio-products. They also include sensors and sensor systems to measure machine performance and crop material properties for Precision Farming systems as applied to hay, forage and bio-mass crops.

Teaching:
Spring 2013
  BSE 309: 2 Credits, 1 Team of 4 Students
  BSE 476: 3 Credits, 40 Enrolled
Fall 2013
  BSE 475: 3 Credits, 18 Enrolled
  BSE 509: 3 Credits, 2 Teams of 4 Students

Graduate Students Advised:
Scott Dietsche (Master’s Degree)
Brandon Nigon (Master’s Degree)
Justin Orrick (Master’s Degree)
Ashley Stubbe (Master’s Degree)
Glenn Wiskur (Master’s Degree)

Research:
1) BioMODS – biomass optimized delivery system.
   USDA-NIFA. 9/13 through 8/16. $556,717
   ($389,724 direct funds to BSE).
2) Mapping of grain and MOG flow from combine
   separator. John Deere Harvester Works –
   Global Crop Harvesting Product Development
   Center. 5/13 through 12/15. $144,418
   ($101,328 direct funds to BSE).
3) Agro-ecosystem approach to sustainable
   biofuels production via the pyrolysis-biochar
   platform. USDA – AFRI CAP (subcontract
   through Iowa State University). 8/11 through
   7/16. $868,454 ($677,395 direct funds to BSE).
4) Investigation of methods to harvest and store
   corn stover as a biomass feedstock. John Deere
   Harvester Works – Global Crop Harvesting
   Product Development Center. 12/07 through
   6/15. $406,744 ($279,170 direct funds to BSE).
5) Harvester modifications to collect sugar cane
   residue and harvest energy cane feedstocks.

John Deere Thibodaux. 10/11 through 6/14.
   $256,889 ($178,743 direct funds to BSE).
6) Novel technologies for field fractionation,
   harvesting and storage of perennial bioenergy
   crops. USDA-ARS. 9/08 through 8/13.
   $118,048 (all direct funds to BSE).

Peer-Reviewed Journal Articles
3) Shinners, K.J., G.C. Boettcher, D.M. Schaefer,
   and A.M. Troutman. 2013. Cattle preference
   for hay from round bales with different wrap-
   types. Professional Animal Scientist. 29:665-
   670.
4) Keene, J.R., K.J. Shinners, L.J. Hill, A.J. Stallcop,
   S.J. Wemhoff, H.D. Anstey, A. J. Bruns and J.K.
   Johnson. 2012. Single-pass baling of corn
5) Digman, M.F., T.M. Runge, K.J. Shinners and R.D.
   Hatfield. 2013. Wet fractionation for improved
   utilization of alfalfa leaves. Biological
   Engineering. 6(1): 29-42.
6) Digman, M.F., K.J. Shinners and M.E. Boettcher.
   2013. Crop mergers: management of soil
   contamination and leaf-loss in alfalfa. Applied
   Engineering in Agriculture. 29(2): 179-185.
7) Williams, S.D. and K.J. Shinners. 2013. Farm-
   scale anaerobic storage and aerobic stability of
   high dry matter perennial grasses as biomass
   feedstocks. Biomass and Bioenergy. Revisions
   submitted.
   Muck. 2013. High dry matter whole-plant corn
   as a biomass feedstock. Biomass and Bioenergy.
   In Press.
Technical Papers/Reports

Outreach Publications

Abstracts, Posters, and Oral Presentations
1) Shinners, K.J. 2013. Challenges with harvest, storage, and transport of perennial grasses as biomass feedstocks. Presented at Switchgrass II September 11th, 2013. Madison, WI.
2) Shinners, K.J. 2013. Review of corn stover harvest and storage research at UW. Presented at DAM II – Deere-ADM-Monsanto Corn Stover Team; November 14th, 2013. Ames, IA.

University and Professional Service
1) Mentor Committees
   a) Troy Runge
2) Department
   a) Graduate Research and Instruction Committee
   b) Undergraduate Instruction Committee
   c) Facilities Operation Committee – Chair
   d) Department Advancement Committee
3) College and University
   a) Search Committee – CALS ARS Hancock Station Superintendent
   b) Graduate Faculty Executive Committee (GFEC)
   c) GFEC Sub-committee on MS Program Accreditation
   d) Ten-Year Review – Chemical and Biological Engineering
4) Professional
   a) ASABE PM-23/7-2 Forage Harvesting and Utilization Committee - Chair
   b) ASABE PM-44 Machinery Management Committee
   c) ASABE FPE – 709 Biomass Energy and Industrial Products Committee
   d) Board Member – Wisconsin Custom Operators
5) Grant Review Committee
   a) Merit Review Committee for Advanced Biomass Feedstock Logistics Systems II FOA-Golden CO; April 22-23rd, 2013
6) Manuscripts Reviews
   a) Transaction of the ASABE (2)
   b) Applied Engineering in Agriculture (1)
   c) Biomass and Bioenergy (1)
   d) Biotechnology for Biofuels (1)

Significant Accomplishments
1) Received NIFA funding for BioMODS - biomass optimized delivery system in conjunction with Texas A & M University.
2) Mentored design team of Dietsche and Nigon which won 1st Place in ASABE AGCO Design Competition
3) Single-pass round baler for biomass harvest which was first developed at UW has been commercialized through John Deere and Hillco Technologies http://www.youtube.com/watch?v=xD-zEHeXhOA
Anita Thompson  
Associate Professor, Ph.D.  
50% Teaching / 50% Research  
Natural Resources and Environment

Some fields of interest of Dr. Thompson are hydrologic implications of land use change, urban hydrology and stormwater management, water quality impacts of biofuel crop production, cold regions hydrology, hydrologic modeling, sediment, nutrient and pathogen transport, and polyacrylamides and biosolids for fertilizer and erosion management.

Teaching:
Fall 2013:
BSE 473: 2 Credits, 24 Enrolled  
BSE 509: Advisor to NR&E Group, 4 Enrolled  
BSE 671: 3 Credits, 11 Enrolled

Advising:
Graduate Students:
Jasmeet Lamba (Ph.D. Student)  
Michael Polich (Master’s Degree)  
Stephanie Prellwitz (Master’s Degree)  
Harsh Singh (Ph.D. Student)  
Ryan Stenjem (Master’s Degree)
Post Master’s and Post-Doctoral:
Dr. Damodhara Mailapalli (Post-Doctoral)  
Zach Zopp (Assistant Researcher)

Research:
1) “Quantifying wintertime drivers of soil erodibility: Improving soil sustainability in agriculture and scientific literacy within a changing climate.” USDA-NIFA Hatch. $237,243. [P.I.s A.M. Thompson, N.J. Balster]
4) “Predicting sediment delivery in Wisconsin agricultural watersheds.” USDA-NIFA Hatch. $143,938. [P.I. A.M. Thompson]
5) “Pathogen Transport during Spray Irrigation of Liquid Manure.” WI Department of Natural Resources. $75,560. [P.I.s K.G. Karthikeyan, A.M. Thompson, J. Panuska, M. Borchardt]
6) “P Index and Snowmelt Runoff Risk Assessment: Demonstration and Refinement.” USDA-Conservation Innovation Grant. $134,850 [P.I.s A.M Thompson, L. Good, J. Panuska, K.G. Karthikeyan, D. Busch]

Publications:
Abstracts/Papers/Presentations:


Professional Development Activities
1) Sabbatical Leave, Spring 2013

Professional Service
1) Department and University Activities
   a) Member, UW Committee for Undergraduate Recruitment and Financial Aid 2013-Present
   b) Member, BSE Development and External Relations Committee 2013-Present
   c) Member, BSE Building and Space Committee 2010-2013
   d) Member, BSE Undergraduate Instruction and Program Committee 2002-Present
   e) Member, BSE Awards Committee 2007-Present
   f) Faculty Senator Alternate 2013
   g) Member, The Nelson Institute for Environmental Studies Transportation Management and Policy Certificate Curriculum Committee 2004-Present
   h) Member, Biology in Engineering Certificate Program Committee 2009-Present
   i) Member, The Nelson Institute for Environmental Studies, Water Resources Management Program Committee 2010-Present
   j) Chair, R. Larson Mentor Committee 2011-Present
   k) Mentor, Women Faculty Mentor Program 2010-Present

2) Professional
   a) Associate Editor, Transactions of the ASABE 2008-Present
   b) Representative, Consortium of Universities for the Advancement of Hydrologic Sciences 2011-Present
   c) Vice-Chair, ASABE SW-223, Soil Erosion Research Committee 2013-Present
   d) Member, American Society of Agricultural and Biological Engineers 1996-Present
   e) Member, American Water Resource Association 2008-Present
   f) Member, American Geophysical Union 2007-Present
   g) Member, ASABE SW-21 Hydrology Committee 2004-Present
   h) Member, ASABE SW-22 Erosion Control Committee 2004-Present
   i) Member, ASABE BE-22 Ecological Engineering Committee 2003-Present
   j) Member, ASABE SW-07 Nomenclature Committee 2010-2013
   k) Technical Reviewer:
      i) Water Quality Health and Exposure (1)
      ii) NSF Competitive Grants Program (1)
BSE Center Activity Reports

UW Center for Ag Safety and Health Cheryl Skjolaas  
Senior Outreach Specialist  
Interim Director

University of Wisconsin Center for Agricultural Safety and Health was authorized in May 1994 by Wisconsin Act 455 to respond to the agricultural safety and health needs of the farming community. It is funded primarily through Cooperative Extension within the University of Wisconsin-Extension (UWEX) and is a joint effort of UWEX and the Department of Biological Systems Engineering, College of Agricultural and Life Sciences, University of Wisconsin-Madison. Cheryl Skjolaas, has been the Interim Director for the Center since 2003. Jeff Nelson supports the work of the Center bringing his expertise in farm rescue and machinery. Jenna Sanford has been a student assistant since May 2012 and is a food engineering major.

Teaching:
Agricultural Safety and Health Course for Short Course, 1 Credit, 41 Enrolled

Extension/Outreach Activities
1) Responded to programming requests resulting from Wisconsin OSHA outreach and enforcement efforts. OSHA Related Activities included:
   a. In partnership with WI OSHA coordinated and facilitated Dairy Worker Roundtable 4 to inform a variety of dairy and insurance industry representatives on activities related to dairy worker safety.
   b. Coordinated and assisted with presentation materials for an OSHA Hazard Communications webinar 11 for participants. Participants represented dairy, potato and vegetable farm owner/operators.
   c. Continued to update OSHA Dairy LEP resource materials and populate the fyi.uwex.edu/agsafety website.
   d. Developed a program for members of the Wine Growers Association on OSHA general industry standards for wineries and presented at their annual conference to over 50 members.
   e. Presented a session on OSHA for the Rock County Farm Bureau members.

2) Administered $19,000 for use with 2012-2013 County Farm Safety Grants.

3) Continued to provide technical assistance and resources to Agricultural, 4-H and Youth Development, and vocational agricultural instructors on all aspects of agricultural safety.

4) Continued to administer the Wisconsin Safe Operation of Tractor and Machinery Certification (TMC) program. Continued to develop website with resources http://fyi.uwex.edu/tractorcert as reported by certifying authorities 339 students received state certificates.

5) Taught a session on confined spaces for the Dodge County TMC, February 2013 and a session on road safety for the Walworth, Kenosha, Racine TMC in June 2013.

6) DOT/DATCP Road Study
   a. Continued work as an appointed member of the DOT/DATCP Road Study Committee.
   b. Co-chair education sub-committee and participated in equipment sub-committee activities.
   c. Coordinated informational meetings that evolved into 6 Town Hall meetings, held August and September, 2013. Town Hall meetings were attended by over 1200 farmers, custom operators, and town, county and state officials.
   d. Assisted with development of support materials for Town Hall meetings as well as
on-line survey used to collect input for the final Road Study recommendations.

e. Presented to over 100 participants at the Trio Conference as part of a Wisconsin Custom Operators meeting on Phase I Road Study report. Participants included farmer, WCO and PNAAW members, and equipment manufacturers. Also presented to the WI Section of ASABE in March 2013 on this effort.

f. Presented on the draft legislation to the Columbia County Corn Growers Association and Fond du Lac County Forage Council, December 2013.

g. Developed educational display on road safety for Wisconsin Farm Bureau Federation annual conference and participated in session on Road Issues, December 2013.

7) A continued emphasis for 2013 focused on assisting agricultural operations in response to an OSHA Local Emphasis Program (LEP) initiated in November 2011 for the dairy industry. OSHA resources were added to the webpage was created on the http://fyi.uwex.edu/agsafety to expand the site for individual’s seeking further information and guidance. A two page “Quick Glance at the OSHA Dairy LEP” was update and distributed through the UWEX agricultural agents’ newsletters and at the annual PDWP conference in collaboration with the UWEX Dairy Team display. Materials were prepared for the DNR/UWEX CAFO Update Meetings held during February/March and presented by UW Extension educators reaching over 300 farmers, crop consultants and engineers.

8) Dairy Worker Roundtable IV was held via webinar in December 2013. The purpose of this webinar was to discuss the outcome of the 2012-13 LEP and present changes for 2013-14. The webinar format allowed individuals from outside of Wisconsin interested in dairy worker safety to participate in the Roundtable. The 22 participants were from WI OSHA Area Offices, OSHA Region V Office, DOL Wage and Hour including Specialty Populations, PDWP, UWEX, WI Technical Colleges, Rural Insurance, National Farm Medicine Center, Southwest NIOSH Ag Center and NYCAMH.

9) Continued to collect and review farm-related fatalities.

10) Continued work with the Professional Nutrient Applicators Association of Wisconsin (PNAAW) on confined space and road safety issues in conjunction with the workgroup for the UW Extension Nutrient Management Team.

11) Continued work with the Wisconsin Custom Operator Safety Committee on worker safety and road safety issues.

12) Displayed at the WI FTD Barron County with assistance from Jeff Nelson, Outreach Specialist, BSE, on road safety, tractor overturns and with Mary Bauer, OSHA Eau Claire Regional Office, on grain handling safety. Selected as the recipient of the Donald Peterson Award.

13) Continued to develop and enhance the Center website (http://fyi.uwex.edu/agsafety) using Wordpress software with assistance from UW Cooperative Extension.

14) Served on planning committee for the Midwest Manure Summit III held February 26-27, 2013. Taught a breakout session on design considerations for confined spaces in manure storage and handling system.

15) Extension Disaster Education Network
   a. Continued as EDEN POC for UWEX.
   b. Hosted the 2013 EDEN Annual Meeting, October 7-11, 2013 at UWEX Pyle Center, for 62 participants from US, Guam, and Philippines.
   c. Served on Executive Committee as the Annual Meeting host.
   d. Member of Drought NEIL to develop drought related educational resources.

16) Contributor to eXtension FRESH Community of Practice (COP).

17) Participated in NCERA 197 multi-state committee on agricultural safety and health activities.

18) Responded to media requests for information and radio interviews.

Publications:

1) A video CD (also on UWEX You Tube) on Horizontal Silo Management and Safety was developed with Brian Holmes, BSE, and former UWEX educator Katie Behnke. Additional release is awaiting UWEX to complete Spanish translation.

Websites Maintained:

1) http://fyi.uwex.edu/agsafety
2) http://fyi.uwex.edu/loh
3) http://fyi.uwex.edu/tractorcert

Professional Development

1) Attended ASABE Annual Conference, July 2013
AgrAbility of Wisconsin started in 1991 upon receipt of a grant from the United States Department of Agriculture. The purpose of the project is to assist farm workers and families who are dealing with disabilities, allowing them to continue in their way of life. Services provided include education, technical assistance, and identification of funding resources. AgrAbility staff provides on-site consultative services and assessments to determine farm modifications and adaptive technology that can be used to assist disabled or otherwise impaired farm workers. Modifications can range from adding a set of extra tractor steps to completely redesigning a milking parlor, and are adapted to each situation. In the past year, AgrAbility of Wisconsin has served 442 clients with 125 of those individuals being first time clients in our 2012-13 grant year. In its 22 years of existence, AgrAbility of Wisconsin has served over 2,200 clients with a 97% success rate, which is defined as clients who are able to keep farming after services are provided.

AgrAbility of Wisconsin exists as a cooperative partnership between University of Wisconsin-Extension and the Easter Seals Wisconsin FARM program. UW-Extension handles client intake, outreach, and education, while Easter Seals staff provides onsite assessments and adaptation recommendations specific to each farm and situation. Under this unique partnership, AgrAbility of Wisconsin also works with the Division of Vocational Rehabilitation (DVR) to connect clients with services such as funds to purchase assistive technology and rehabilitative services. AgrAbility of Wisconsin services are provided confidentially and free of charge to farm families and workers dealing with the effects of a disability or limitation. Impairments can range from arthritis, amputations, and respiratory illnesses to cognitive disabilities and hearing or visual impairments.

**Teaching:**
1. Life Science Communications 270 Fall Semester-Communication in Life Science Industries
2. OTA Western Tech Class Farm Visit, La Crosse, WI
3. Kewaunee County UW Extension Rural Safety Day, Kewaunee, WI
4. Oregon FFA/Ag. Class presentations, Oregon, WI
5. AT Across the Lifespan Conference, WI Dells
6. Agriculture Assistive Technology Training on-line training course delivered to 253 Participants from 41 different states across the country.

**Extension/Outreach Activities**
1. AgrAbility - Agricultural Assistive Technology Training, MSN141967, Easter Seals Wisconsin
2. AgrAbility of Wisconsin Project Number: 143-143A488, Easter Seals Wisconsin.
3. Midwest Farm Show, La Crosse, January 16-17th
4. Marshfield Farm Show- Shoppes at Wood Ridge, Marshfield, January 20-21st
5. Eau Claire Farm Show, Eau Claire, March 5-6th
6. WPS Farm Show, Oshkosh, March 26-28th
7. MATC Assistive Technology Fair, Madison, May 6th
8. AgrAbility of Wisconsin Summit, Marshfield, May 16th

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9) UWEX New Staff Orientation, Madison, May 23rd
10) Kewaunee County UW Extension Rural Safety Day, Kewaunee, Kewaunee, May 22nd
11) ISFAC Quarterly meeting, Waukesha, June 6th
12) State FFA Convention, Madison June 12th
13) Farm Technology Days – Barron, July 9-10th
14) Indian Summer Festival-VA, Milwaukee, September 8-11th
15) EDEN Conference tours, Madison, October 8th
16) ANRE Conference, Wisconsin Dells, October 9th
17) Neighbor to Neighbor meeting- Jeff Berg, La Crosse, October 23rd
18) Neighbor to Neighbor meeting- Dale Peterson, Grantsberg, October 28th
19) AgrAbility Advisory Council meeting, Madison, November 1st
20) AT Across the Lifespan Conference, WI Dells, November 13-14th
21) UWEX New Staff Orientation, Madison, October 14th
22) OTA Western Tech Class farm Visit, La Crosse, November 26th
23) Farm Bureau Annual Meeting, December 6-7th
24) Virtual National AgrAbility Training Workshop, December 10-12th
25) Oregon FFA/Ag. Class presentations, Oregon, December 19th

Research:
2) Structural Design of Hoop Houses. Made WFBA and ASABE presentations on an insulated wood foundation for hoop houses. ASABE paper was accompanied by a paper on the subject. Recently designed unique portable hoop house for use at WMARS. Construction of hoop house with wood foundation funded in part by $6000 USDA grant.
3) Evaluation and Optimization of Post-Frame Thermal Envelopes. Continued work with graduate student Holstein on a rotatable guarded hot box. Federal Hatch for 3 months at $43,000/yr. BSE Department for 9 months at ~$36,000/yr.
4) Development of Small-Scale Storage Facilities For Winter Storage of Fresh Produce. Supports Scott Sanford work. SARE Grant through University Of Minnesota. $36,000/yr.
5) Development of Sustainable Post-Frame Building System. Worked with Holstein on submittal of ASCE and ASABE journal articles for this recently completed Hatch supported project.
6) Sustainable Air Conditioning Systems For Plant Growth, Animal Growth And Food Storage Facilities. Worked with graduate student Styx on the development of a low-cost, high volume, heat exchanger for high-moisture environments. Project was completed for Styx’s M.S. degree. Project funded with money from EPD professional development courses.
7) Moment Resisting Post-to-Concrete Connection. Designed, fabricated and installed (for field testing) a new post-to-concrete pier connection with high bending strength in 2013. Personally funded. Working to secure funds for laboratory testing.

Publications:
1) AgrAbility Keeps Farmers Farming. Hoard’s Dairyman, March 25, 2013
2) AgrAbility of Wisconsin Helps Farmers Overcome Obstacles. WFBF Rural Route, April/May 2013
http://issuu.com/wfbf/docs/ruralroute(apr/may2013
4) AgrAbility Summit to provide resources for farmers with disabilities. Marshfieldnewsherald.com, May 9, 2013.
http://www.marshfieldnewsherald.com/article/20130509/MNH01/305090398/AgrAbility-Summit-provide-resources-farmers-disabilities
http://www.hoards.com/calendar/05-16-2013
7) Agriculture and Disability in Wisconsin. The Rehabilitation Resource-DVR, June 2013.
http://dwd.wisconsin.gov/dvr/rehab_resource/
newsletter/2013/06_newsletter.htm

8) Getting Back in the Fields. UW Madison, Big Ten Network June 7, 2013. https://www.youtube.com/watch?v=SFgQrAt7nQ


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**Professional Service**

1) Department
   a. BSE Social Committee Member and photographer for various department uses.

2) College/Campus/University
   a. CALS Communicators Committee Member

3) Professional (ASABE/Other)
   a. National AgrAbility Training Workshop Committee member
   b. National AgrAbility Networking committee member
   c. National AgrAbility Marketing committee member
   d. National AgrAbility Evaluation committee member
   e. Inter-Service Family Assistance Committee (ISFAC) member

4) Civic Service
   a. State, National and County Holstein Association Member
   b. Dane County Holstein Association Secretary
   c. Wisconsin Holstein Young Adult Committee Member
   d. State certified 4-H Judge
   e. World Dairy Expo Volunteer
Academic Staff Activity Reports

John Panuska
Natural Resource and Bio Environmental Engineer, Ph.D.
100% Extension
Water Resources and Water Quality

Dr. Panuska is registered as a Professional Engineer and professional Hydrologist in Wisconsin. He has research and Extension interests in drainage, irrigation and phosphorus loss from agricultural management systems, watershed runoff and water quality computer modeling, sediment transport and delivery from sources to receiving waters, development and application of water quality management models and erosion control.

Teaching:
BSE 201: 1 Credits, 25 Enrolled
BSE 309: 1 Group of 5 Advised
BSE 509: 1 Group of 4 Advised

Extension/Outreach Activities
1) Technical Support for the Arlington Agricultural Research Farm. Land surveying and conservation design support services were provided to the Arlington Agricultural Research Station (AARS) included several projects. First, a static GPS control survey was completed for the bench mark located near the AARS weather station. Final horizontal and vertical coordinates were computed and verified using a static GPS baseline vector approach and provided to the AARS staff. Project cooperators include the WI Department of Transportation and the WI representative to the National Geodetic Survey. A second project included completion of field staking and a GPS control survey for waterway and terrace construction on fields south and east of the existing headquarters building. The terrace and waterway design work were previously completed as a BSE 509 senior design project. A third project included the GPS survey of and old waterway through fields adjacent to Co. Rd I and west of the Soils storage building and the development of a new waterway profile to be field staked and constructed during 2014.

2) Irrigation Water Management Training.
Collaboration from UW Cooperative Extension and ANRE Program Area. I completed six irrigation water management training sessions around the state. The audience included UWEX Ag. agents, crop consultants, government agency staff and growers. This training seeks to build greater understanding across a broad range of topics that include: water behavior in soil, sources and sinks for root zone soil water as well as monitoring and tracking root zone soil water content or understanding the root zone soil-water mass balance. Technical assistance in tracking the soil-water mass balance is provided by introducing growers to our new web-based tracking tool, the Wisconsin Irrigation Scheduling Program (WISP) which is now operational. WISP can be accessed from a desktop computer or via portable device such as a smart phone. The WISP tool allows growers to track and report total annual water use and warms them when leaching will occur. In addition, new research suggests that some irrigation water application timing strategies, such as deferred irrigation on soybeans, can further reduce annual consumptive use.

Research (Co-Principle Investigator):
1) UW Consortium Grant re-funded with UW-Platteville and Stevens Point titled: Laboratory and field evaluation of two passive, low-cost samplers for monitoring edge-of-field surface-water runoff. Sampler performance for flow splitting, sediment concentration and particle size analysis is being conducted in a laboratory flume at the UW-Platteville Pioneer Farm, Total grant amount = $39,586.00 ($9,422 UW-Madison).
Conservation Innovation Grant (CIG) to investigate the impact of tillage induced roughness on spring snow melt runoff volume. Several small watersheds are being monitored for flow and tillage surface roughness. Results will be incorporated into the WI phosphorus Index.

**Lectures & Technical Advising**

1) Agriculture Energy Webinar. Completed a national webinar for the Natural Resources Conservation Service on agricultural soil water management. Information included irrigation scheduling and soil moisture monitoring.

2) Nutrient and Pest Management Program Advisory Team. Participate on the program advisory board for the NPM program. Attended one day-long meeting.

3) Invited Speaker (WCMC). Invited speaker to the 2013 Wisconsin Crop Production Conference.

4) Invited Speaker (Frontier FC Coop). Conducted two training session on irrigation water management and soil moisture monitoring.

5) Update the Wisconsin Irrigation Scheduling Program (WISP 2011) – Principal investigator to develop and distribute a new web-based irrigation scheduling tool to replace several existing outdated scheduling programs.

6) Invited Speaker - Conservation Professional Development Training. Completed a training session on the use and application of computer models to NRCS staff.

7) Invited Speaker. WI Processing Crops Meeting to present on irrigation water management.

8) Invited Speaker. WI Land and Water Conservation Association to discuss research related to spray drift and irrigation of manure liquids.

9) Manure Runoff Risk Mapper. Technical advisor to a multidisciplinary team developing an automated web-based decision support tool for manure runoff risk. The mapper uses the National Weather Service flood forecasting model and shows runoff risk by watershed area state wide.

10) WI Nutrient Reduction Strategy Team. Member of the technical advisory panel lead by the WI Department of Natural Resources to develop a statewide nutrient reduction strategy as required by US EPA. Attended a work shop in Davenport Iowa sponsored by the Soil and Water Conservation Society to discuss Iowa’s nutrient reduction strategy.

11) Demonstration Storms for Identifying Climate Vulnerability. Invited to participate on the technical advisory panel for a NOAA Grant lead by P.I Dr. Ken Potter and Co-David Liebl to investigate and transpose extreme storm events for use in the evaluation of stormwater infrastructure.

12) Invited USDA Grant Reviewer. Participated in a NIFA grant review panel for USDA - AFRI, RENRE Foundational Program: Microbial Communities in Soil of USDA, National Institute of Food and Agriculture (NIFA), Institute of Bioenergy, Climate and Environment (IBCE). in Washington, DC.

13) Invited Grant Reviewer. For the Leopold Center for Sustainable Agriculture to review a grant application on a tile drainage research project.

**Poster & Presentations**

1) Wisconsin Potato and Vegetable Growers Association Annual Educational Conference, 2013 Wisconsin Farm Technology Days (irrigation posters and equipment demonstration).

**Professional Services**

1) BSE Survey Lab. Manager. Provide land surveying support services and equipment to BSE, and other CALS departments as needed. Provided land surveying support for the spray irrigation research project, BSE 509 senior design project, the climate change in dairy production grant project.
Jeff Nelson
Senior Research Specialist/Lecturer/Computer Support
50% Teaching / 50% Research
Power and Machinery, Precision Agriculture, Information Technology

Teaching:
Farm Power Short Course: 2 Credits, 22 Enrolled
Farm Machinery Short Course: 3 Credits, 35 Enrolled
InterEgr 160: 3 Credit, 31 Enrolled

Extension/Outreach Activities
1) Farm Rescue Program in Shawano County. 2 hour presentation to the Shawano County EMS Association. Attended by about 30 personnel.
2) Produced and staffed a Farm Safety display at Farm Technology Days. Assisted other dept. personnel with their displays. Interviewed and appeared on Eau Claire TV for a Tractor Rollover display
3) Presented at Dane County Tractor and Machine Operation class. 25 11-17 yr olds. Tractor rollover, auger entanglement, PTO entanglement, landed MedFlight. Participated as Middleton Fire and BSE.

Computer Support:
1) Maintenance of the computer lab in 217. Duties include physical maintenance of the lab room, maintenance of the BSE controlled software and computer hardware, local contact for the CAE managed machines.
2) Department-wide activities include troubleshooting problems, consulting on purchases, installing new software, updating old computers, maintaining the departmental server, and attending various training seminars on campus.
3) Maintain the department’s network infrastructure as a DoIT Authorized Agent.
4) Represent the department on a CALS Info Tech user group.
5) Local support contact for the 101 classroom AV system.
6) Maintain an AV system in the B25 and 118 classrooms.
7) Mounted and implemented the Main Hall Information monitor. Create and maintain announcements
8) Oversaw the move of DHCP service to DoIT.
9) Assisted Dr.Xuejun Pan with starting a website on the CALS web hosting service.
10) Set up, maintain, and trained students in the use of the new 3D printer. One student group created a model that helped them win a national design competition
11) Participated in a campus-wide live evaluation of the new Office365 email and calendaring system

Other Activities:
1) Guest speaker for Panuska’s BSE 201 – GPS Technologies and Equipment
2) Superintendent of the State FFA Agricultural Mechanics Career Development Event. 88 students from 23 schools participated
3) Served on the Building and Space, Information Technology, and Undergraduate Instruction committees
4) Attend various seminars related to Instructional Technology and campus computing issues
5) Worked with Debby Sumwalt to produce and host a departmental display at the Majors Fair in Union South
6) Assisted with maintaining department Continuation Of Operations Plan (COOP) and Emergency Occupant Plan
7) Assist with the NIDRR AgrAbility Training grant – developing on-line training materials for Rehab Counselors and technical assistance with the on-line course.

Civic Service:
1) Middleton Fire Department: Maintain and support the department’s computers, Aerial and engine operator, Served on a committee putting together a new Heavy Rescue vehicle, Fire Investigation Team member, Hazardous Materials Technician, Spent Fire Prevention Week presenting in all the elementary schools in Middleton, and American Heart Association Certified CPR Instructor
Scott Sanford
Senior Outreach Specialist
25% Extension, 10% Teaching, 65% Gift/Grant
Rural Energy Program

Scott Sanford is a Senior Outreach Specialist in the Biological Systems Engineering department at the University of Wisconsin-Madison where he has been on staff since 2002. He works on and manages the Rural Energy Program. He has developed audit tools and educational materials for the program and makes presentations on energy conservation. Currently he is working on energy conservation on dairy farms, irrigation system, grain drying, cold storage facilities and greenhouses. Scott also teaches the Agricultural Energy Management and the Introduction to Precision Agriculture courses for the Farm and Industry Short course program. Prior to joining the university, Mr. Sanford worked in the dairy equipment business for 17 years holding positions in engineering, marketing and manufacturing.

Teaching:
- Ag Energy Management, 22 Enrolled
- Intro to Precision Agriculture, 15 Enrolled
- BSE 367: Online Teaching Assistant
- BSE 473: Irrigation Equipment
- HORT 334: Greenhouse Energy Efficiency
- DYSC 433: Milking Units/Milking Parlors

Extension/Outreach Activities
1) Farm Tech Days. Field Demo sub-Chairperson. Oversaw field demo during show. Coached county Field Demo committee. Developed an LED lighting display for the Applied Technology Center.
2) WFMVGA Meeting. Environmental Control in High Tunnels
3) Greenhouse Energy Auditor Training. Franklyn Energy Services LLC
4) Greenhouse Energy Efficiency. SD Organic Growers Conference
5) On-Farm Energy Conservation. SD Organic Growers Conference
7) SARE Development of Small-Scale Facilities for Winter Storage of Fresh Produce Presentation at South Dakota Organic Growers Conference.

Research:
1) Energy Self-Assessment Website Maintenance - DJ Reinemann, SA Sanford Funding from USDA-NCRS ($56,350). Project provides maintenance and web hosting services for the Energy Self-Assessment web site previous developed. Provide troubleshooting, error corrections and programming support. Answer e-mail and phone inquiries as needed. Provide assistance in transferring the website to USDA at the end of the maintenance period. Project dates: 8-15-2011 to 7-31-2014
2) SARE Regional Agricultural Energy Use Professional Development. Funding from AGRIC, COOP STATE RESEARCH EDUCATIONAL & EXT SERV ($74,919). Develop a resource list for energy efficiency and webinars on the topics of dairy farms, grain drying, irrigation, greenhouses, animal housing (poultry/swine/equine), and field crops. Project dates: 1/1/2010 to 12-3-2011 Extended to 6-31-2013
3) SARE Research & extension grant – Bohnhoff/Sanford. Funding from USDA-National Institute of Food & Agriculture ($107,742). PI Development of Small-Scale Storage Facilities for Winter Storage of Fresh Produce. Develop designs and plans that are expandable for small scale cold storage facilities targeted at winter stored crops. Develop low-cost environmental controls to aid in controlling temperature and maintaining humidity levels. Author a publication that covers the design and management of winter storage facilities. Hold workshops and webinars throughout the
Midwest to disseminate the information and plans. Project Dates: 9-1-2011 to 8-31-2013
Extended to 8-31-2014
5) On-Farm Energy Quality Assurance Training – Sanford PI. Funding from USDA-NRCS ($100,000). Develop series of webinars for training NRCS personnel about energy use in different agricultural enterprises. Provide written materials and references for webinar presentations. Setup and coordinate an in-person field training session. Provide consultation on reviewing audits. Project Dates: 9-24-2013 to 9-30-2014

Publications:

1) On-Farm Energy Conservation & Efficiency Series – S. Sanford
http://fyi.uwex.edu/biotrainingcenter/
2) Lighting Technology: LED lamps for Home, Farm and Small Business - Scott Sanford (currently in layout and production – UWEX A publication)
3) Wood Heating Appliances for Homes and Businesses - Choosing the right equipment - Scott Sanford, David S. Liebl (currently in layout and production – UWEX A publication)

Professional Service

1) ASABE Committees
   a. SE-303 – Environment of Plant Structures
   b. IET-441 – Milk Handling Equipment
   c. IET-433 – Electrical Utilization & Energy Applications
   d. FPE-702 – Crop & Feed Processing & Storage
   e. SE-414 - Renewable Power Generation
   f. SW-241 - Sprinkler Irrigation
   g. T-11 – Energy
   h. Wisconsin Section

2) Social Committee BSE – chair
Astrid Newenhouse
Senior Scientist, Ph.D.
10% FTE Jan.-July and Sept., 42% FTE Oct.-Dec.
Healthy Farmers Healthy Profits

During 2013, Larry Chapman and I expanded the outreach of projects previously completed concerning fall prevention in rural nursing homes and home health agencies. This work received recognition from nursing staff and people who work in aging and disability fields. Although unsuccessful in securing funding to continue agricultural safety work, we made new contacts for our network of people who may be interested in applying for grants together or working on future projects. These contacts were mostly in health related fields. With the Midwest Rural Energy Council, Newenhouse began a project to develop a presentation handout on wind energy and stray voltage into an Extension publication, filling a need for information in this area and making the information accessible to a wider audience.

Extension/Outreach Activities:
1. Center for Agricultural Safety and Health:
2. Distributed two publications (developed in 2012) Nursing Facilities Annotated List of Falls Management Resources, and Home Health Agencies Annotated List of Falls Management Resources throughout Wisconsin and nationally via venues such as the Wisconsin Clinical Resource Center, the Wisconsin Office of Rural Health, and Aging and Disability Resource Centers. Here is a sample comment describing the impact of this work: I am a Community Health Educator with the Aging & Disability Resource Center of Central Wisconsin and co-chair of the Wood County Falls Prevention Coalition. Your work with The Falls Management Program was passed along through one of the statewide listserves and I’m finding it very helpful. Our team just completed a survey with 99 facilities in Wood County....
3. Distributed information and research results upon request to farmers, previous funders, government agencies, and non-profits.
4. Maintained connections to farm managers, advisors, researchers, and tool distributors in US and abroad concerning work efficiency and ergonomics.
5. Midwest Rural Energy Council Scholar:
6. Outreach concerning rural energy issues including helping coordinate an annual conference, workshops, and developing Extension publications.
7. ad-hoc Senior Scientist
9. Participated in CALS Communicators meetings.

Research:
With Larry Chapman, wrote research grant proposals concerning rural safety and health issues to agencies such as the USDA Rural Health and Safety Education (RHSE) Competitive Grants Program, State of Wisconsin Department of Health Services Division of Quality Assurance, and The Retirement Research Foundation. Worked with collaborators in the UW Department of Orthopaedics and Rehabilitation, UW School of Medicine and Public Health, UW School of Nursing, regional nursing home staff and associations, private health care agencies, and health care consultants. None of the projects were funded in 2013.

Peer-Reviewed Journal Articles:

Reports
3. Final report, USDA NIFA Rural Health and Safety Education Program (PI Larry Chapman). Front line staff fall prevention training for rural Wisconsin nursing homes. 10/1/2012-9/30/2013, $189,090.

Professional Development Activities:
Promoted to Senior Scientist July 1, 2013.

Professional Service:
College/Campus/University: Participated in UW Cooperative Extension Agriculture and Natural Resources Education Program Area Annual Meeting, also CALS Communicators Meetings.
Profession (ASABE/other): Participated in Joint Council of Extension Professionals Galaxy IV Conference, Sept 16-20, Pittsburgh, PA.
Civic Service: 4-H County Fair Judge, Girl Scout Troop Leader
Paul Thompson
Adjunct Professor, Ph.D.
10% Research on Gifts/Grants
Milking and Milk Cooling

Dr. Thompson’s interests include milking, milk handling, milk cooling, biological sensors, diagnostic ultrasound, alternative energy sources, and business management.

Research:
1) Milking Machine Research. Funded by Avon Dairy Solutions. This project is aimed at developing methods to characterize the performance of the milking liner and to gain a better understanding of the physiological interactions between milking machine liners and the cow. We are especially interested in understanding the influence of liner shape, material and novel new design elements. In addition to assisting as needed, my individual contribution has been to develop sensors for detection of the start and end of milk flow from each teat during machine milking. So far, an optical sensor showed promise, but was abandoned in favor of a vibration monitor mounted on the short milk tube. The characteristic vibratory signatures of air flow only and of mixed air/milk flow have been recorded and this information will be used to develop a Labview V.I. that will detect milk flow start and stop. Correlation of milk flow start or stop with differential pressure across the liner will allow calculation of liner compression under actual milking conditions.

Publications:
Emeritus and Affiliated Faculty Activity Reports

Ferencz Denes
Professor Emeritus, Ph.D.
Research
Food Safety

Dr. Denes has an interest in the fields of plasma-enhanced synthesis and surface modification of materials, immobilization of active biomolecules onto plasma-functionalized surfaces, deposition of anti-fouling and anti-microbial surface layers, plasma-enhanced synthesis of nanoparticle systems, and development of novel non-equilibrium plasma tools.

Research:


2) Development of functionalized nano-particle systems for targeted drug delivery. Collaboration with Richard B. Timmons, University of Texas at Arlington, and Prof. M. Sandor and Prof. Zs. Fabry, Department of Pathology and Laboratory Medicine, UW School of Medicine and Public Health 5468 MSC. Goal: Development of functional nanoparticle systems for targeted drug-delivery applications.

3) Design and Development of an Atmospheric Pressure Surface-Plasma Tool Provided with Cooling/Heating Possibilities (Peltier Effect) of the Surface that is Exposed to the Plasma Layer. Goal: Conversion of low-temperature- and low pressure-deposited organic, crystalline or non-crystalline, sole or multiple thin layers into solid phase three-dimensional macromolecular networks with potential use in microelectronics and optical applications. The functionality of the plasma toll is under evaluation.

Peer-Reviewed Journal Articles


Conferences/Lectures

1) Key-note Lecture of F.S. Denes at the Photopolymer and Science and Technology, International Meeting, Chiba, Japan, June 2013.
Dr. Rowell has interests in the fields of biomaterials, wood chemistry, carbohydrate chemistry, chemical modification of wood, dimensional stability of wood, biodurability of wood, water repellency, and wood hardening.

**Research:**

1) *Development of Advanced Wood Fiber-Based Composites based on Fiber Modification.* Funding from a private company. The performance of wood fiber-based composites can be greatly improved by chemical modification of the fiber the composite is made. Dimensional stability and water repellency can be greatly improved by bulking the cell wall with bonded chemicals and by using hydrophobic reactants. Decay resistance can be greatly improved using the same chemistries since restricting access to water by the microorganisms is one way to stop or decrease fungal attack. One of the technologies that has been studied is the reaction of wood with acetic anhydride. The dimensional stability of acetylated wood and its decay resistance is greatly increased. This is a non-toxic approach to wood preservation that is presently commercially available. New patents are being written to support this research.

2) *Removal of Contaminates from Water.* Funding from public and private funds. Small test filters are being placed in streams that are contaminated from (1) animals that live in or around that stream or (2) land fill in the area. One filter has been placed near Rose Hill Kansas near a cattle farm (63rd road supported by Rose Hill High School), one in Georgia (Canton) near a horse farm (Mill Creek supported by Venture Crew 469), one in Oregon (Portland, supported by Siskiyou Dharma) and one in Wisconsin near a cattle farm. The water is first checked for particles and color and then a small test filter is placed in part of the stream. The filters are made of small particles of bark in mesh bags. The filter remains in the stream for 24 hours and then a water sample is taken to check for particles and color.

3) *Development of Wood with Increase Hardness.* Funding from a private company. The hardness of wood can be greatly increased by impregnating the wood with acrylic monomers and polymerizing them in situ. A vazo catalyst is used along with heat to cure the polymer. A dye can be added to the monomer mixture to change the color of the final wood product. Hardness is increased several hundred present and the final product is used for industrial flooring. Several different acrylates are under test along with different mixtures of acrylates and glycols. Distribution of the in situ polymer is investigated by SEM.

4) *Heat Treatments of Wood in Improve Decay Resistance and Dimensional Stability.* Funding from a private company. Wood that is heated at high temperatures (120-350 C) becomes more decay resistant and has a higher dimensional stability that unheated wood. The mechanism of effectiveness is due to the decomposition of the hygroscopic hemicellulose polymers in the cell wall. There is a 10 to 20% decrease in weight and a decrease in strength properties upon heating either in the presence or absence of oxygen. The heated wood is brash but has increased resistance to brown-rot fungi but not to white-rot fungi. After heating at 220 C for 3 hours, there is a 50% decrease in the equilibrium moisture content and an increase of 50% in dimensional stability.

**Peer-Reviewed Journal Articles**


Patents

Conference Proceedings, Technical Papers/Reports

Larry Chapman
Senior Scientist Emeritus
Research
Healthy Farmers Healthy Profits

Some fields of interest of Mr. Chapman include neurotoxicology, ergonomics, work design, labor efficiency in agricultural production systems, intervention evaluation effectiveness in occupational health, technology transfer and diffusion of innovations, occupational stress, fresh market vegetable production methods, dairy production methods, and childhood and adult injury prevention.

Research:
John Ralph
Affiliate Professor
WI Bioenergy Initiative

Graduate Students Advised:
Wu Lan (Research Assistant)

Research:
1) Plants Designed for Improved Processing. Wu Lan. Funding from DOE GLBRC Project 1.1.9. Lots of Collaborators. The long-term project goals are to understand lignification and cell wall crosslinking, and the limits to cell-wall-phenolics metabolic plasticity, to alter composition and structure in ways that significantly improve biomass processing energetics.

2) Lignin Management: Optimizing Yield and Composition in Lignin-Modified Plants. Matt Regner, Yukiko Tsuji, Hoon Kim, and Fachuang Lu. Funding from Stanford University’s Global Climate and Energy Program. Collaboration with Wout Boerjan (U. Gent, Belgium), Clint Chapple (Purdue), Claire Halpin (U. Dundee, Scotland), and Xu Li (NCSU). This project aims to maximize the utility of plant lignocellulosic biomass as an abundant, sustainable, and carbon-neutral energy feedstock by optimizing both its yield and composition to facilitate downstream conversions to fuel and electricity.

3) Development of Crucial Tools for Lignin Research. Hoon Kim, Fachuang Lu, Yimin Zhu, Ruili Gao, Alden Voelker, Matt Regner, Yuki Tobimatsu. Funded from DOE Office of Science and Office of Biological Research. Collaboration with Michael Hahn (U. GA), Fang Chen and Richard Dixon (U. NT), and Steve Decker (NREL). Three primary objectives of this research are therefore to: a) Develop a set of monoclonal antibodies to specific structures in lignins – for structural and localization studies; b) Develop a robust and flexible system for producing polymer-supported lignin monomers and oligolignols – for antibody screening, reactivity determination, elucidation of cross-coupling propensities, and beyond; and c) Develop fluorescent-tagged monolignols – to aid in lignin localization studies and to help elucidate monolignol transport mechanisms.

4) Biodegradative Oxidant Production by Fungi in Lignocellulose: in situ Mapping and Relationship to Gene Expression. Vitaliy Tymokhin, Yimin Zhu Funding from DOE Office of Science and Office of Biological Research. Collaboration with Ken Hammel, Chris Hunt, and Carl Houtman (USFPL). Our overall aim in the proposed work is to provide new insights into the mechanisms that fungi of interest employ to degrade lignocellulose.

5) Regulation and Predictive Modeling of Lignin Biosynthesis. Hoon Kim, Sarah Liu. Funding from NSF. Collaboration from Vincent Chiang and Ron Sederoff (NCSU). Our work in this project includes tasks related to lignin structural elucidation.

Peer-Reviewed Journal Articles


4) Y. Zhu, M. Regner, F. Lu, H. Kim, A. Mohammadi, T. J. Pearson and J. Ralph. Preparation of
monolignol γ-acetate, γ-p-hydroxycinnamate, and γ-p-hydroxybenzoate conjugates: Selective deacylation of phenolic acetates with hydrazine acetate. RSC Advances, 3(44), 21964-21971 (2013).


Books & Chapters

Patents

Conference Proceedings
1) M. Regner, Y. Zhu and J. Ralph. New approach to the study of radical coupling propensities in


9) H. Kim and J. Ralph. High-resolution 2D-NMR (HSQC) profiling of the xylan and amorphous cellulose from ball-milled cotton linter cellulose using the DMSO-d(6)/pyridine-d(5) solvent system. Abstracts of Papers of the American Chemical Society, 245 (2013).


**Awards**

1) 2013 - American Chemical Society, Anselme Payen Award (Cellulose and Renewable Materials Division). [to be awarded at the 2014 National ACS in Dallas, March 2014]  

2) 2013 - The University of Seville—BRUKER Award 2012 that recognizes the best scientific paper using NMR techniques for the paper "Structural Characterization of Wheat Straw Lignin as Revealed by Analytical Pyrolysis, 2D-NMR and Reductive Cleavage Methods." http://investigacion.us.es/noticias/756  