Day 1 – Monday, July 11
Plenary Session 1
Location: Ballroom East & Ballroom West **Time: 8:00-10:00 am**

Welcome to CSBE/SCGAB 2011 – Growing Renewable Energy
Doug Small, Chair, Local Arrangements Committee

Introduction of Plenary Speakers
Ron Britton

Speaker #1

Daryl Domitruk "Renewable energy from agriculture: re-profiling agriculture as a solution provider in Manitoba"

Daryl is the Director of the Agri-Food Innovation and Adaptation Knowledge Centre for Manitoba Agriculture, Food & Rural Initiatives. He is based in Morden, Manitoba where he directs province-wide activities in science and innovation. His group includes the Agri-Energy Office, the Canada-Manitoba Crop Diversification Centres and industry development programs in functional foods, bioproducts and biotechnology. Daryl is a graduate of the University of Manitoba Faculty of Agriculture and holds a Ph.D. in Crop Science from the University of Saskatchewan. He has worked in the crop protection industry and for the zero-tillage farmer association prior to joining government.

Speaker #2

David Levin "Bioengineering for Biofuels and Bioproducts at the University of Manitoba"

Dr. David Levin is an Associate Professor in the Department of Biosystems Engineering at the University of Manitoba. He joined the Department of Biosystems Engineering in 2006 after approximately 15 years in the Biology Department at the University of Victoria. David is a specialist in the following fields: bioengineering for biofuels and bioproducts; biological and biotechnological production of hydrogen and ethanol for use as biofuels; biorefining and value-added co-product synthesis; biofuel cells and bioenergy; baculovirology and functional genomics.

10:00-10:30 Refreshment Break

Day 1 – Monday, July 11
Technical Session 1 – Poster Session
Location: Ballroom East & Ballroom West Time: 10:30 -12:00 noon

CSBE11-100	Tower and pendulum impact testers in simulating surgical blows. S. Hildebrand, J. Morrison
CSBE11-101	Hierarchical task analysis of driving a tractor air seeder system (TAS): determining TAS simulator requirements. B. Bashiri, D.D. Mann, D. Karimi
CSBE11-102	Control panel design in agricultural tractors: determining frequency of control use. M. Mastorakos, D.D. Mann
CSBE11-103	Monitoring of rear-mounted equipment. A. Rakhra, D.D. Mann
CSBE11-104	Driving simulation for tractor-air seeder system. B. Bashiri, D. Karimi, D.D. Mann
CSBE11-105	Simulation of soil mechanics using an aerway soil tine. J. Mak, Y. Chen, N. McLauglin
CSBE11-106	Design elements of the University of Manitoba Quarter Scale Tractor
CSBE11-107	Texture profile analysis (TPA) of Omani halwa while replacing ghee with vegetable oils. A. Manickavasagan
CSBE11-108	Ultrasound assisted extraction of lipids from microalgae. M.B. Latheef, M. Ngadi
CSBE11-109	Water requirements of date palm trees in Saudi Arabia. A. Alamoud
CSBE11-110	Effect of water table management on potato yield. S. Satchithanantham, M. Cordeiro, R. Sri Ranjan, S. Sager, B. Shewfelt
CSBE11-111	The effect of storm type and season on the efficiency of vegetative filter strips at watershed scale. S.I. Ahmed, R. Rudra, S. Manzoor
CSBE11-112	Soil compaction and micro-topography effects on corn under tile-drainage. M. Cordeiro, S. Satchithanantham, R. Sri Ranjan, S. Sager, B. Shewfelt
CSBE11-113	Evaluation of flow features in a river reach with TUFLOW model. B. Amirataee, B. Mohammadnezhad
CSBE11-114	Artificial neural network (ANN) to classify Omani date varieties. A. Manickavasagan
CSBE11-115	Conformation analysis of egg white under thermal gelation and determination of protein secondary structures using Raman spectroscopy. W. Wang, J. Paliwal
CSBE11-116	Microwave assisted extraction of phenolic antioxidants from grape seeds (Vitis vinifera). K. Krishnaswamy, K. Thangavel, V. Orsat, Y. Gariepy
CSBE11-117	Determination of flow properties of sliced pineapple and by-product. C. Nwaizu
CSBE11-118	**Withdrawn**
CSBE11-119	Near-infrared hyperspectral imaging of bulk samples of wheat from different growing locations and crop years for quality assessment using principal components regression and partial least squares regression modeling. M. Sivakumar, D.S. Jayas, J. Paliwal, N. White
CSBE11-120	Feasibility of storing canola in large harvest bags under prairie conditions. V. Chelladurai, F. Jian, D.S. Jayas, N. White
CSBE11-121	Synchrotron-source infrared imaging study to map compositional changes in fungal damaged canola seeds. C.B. Singh, D.S. Jayas, F. Borondics, N. White
CSBE11-122	Sprouting detection on wheat kernels using FT-NIR spectroscopy and hyperspectral imaging systems. J. Xing, S. Symons, M. Shahin, D. Hatcher
CSBE11-123	A new approach to resolve conflict situations surrounding livestock productions. M. Belzile, S. Lemay, M. Richardson, J. Gauvin-Racine, S. Godbout

CSBE11-124 TGA model and two-way ANOVA tests on pyrolytic behavior of biomass fuel. N. Yub Harun, D. Jaeger, M. Barbeau

CSBE11-125 Determination of optimum solvent condition and diffusion kinetics for extraction of phenolic compounds from wheat dried distillers grain (DDG). Z. Izadifar, O. Baik

CSBE11-126 Ultrasound aided pretreatment of wheat dried distillers grain (DDG) for extraction of phenolic compounds. Z. Izadifar, O. Baik

CSBE11-127 Energy efficiency of biofuels (biomethane, biodiesel, bioethanol). G. Moitzi, G. Weinberger, J. Boxberger

CSBE11-128 Fuel consumption and energy efficiency of wheat production in different soil tillage systems in the semi-arid region of Austria. G. Moitzi, T. Szalay, M. Schüller, H. Wagentristl, K. Refenner, H. Weingartmann, P. Liebhard

CSBE11-129 Influence of growing location, sample presentation technique and foreign material on features extracted from colour images of wheat. W. Zhang, C.B. Singh, D.S. Jayas, N.D.G. White

CSBE11-130 Custom design of the electric vehicles for Canada. S. Shahidinejad, E. Bibeau, S. Filizadeh

CSBE11-131 Online solar collector data and simulation predictions. E. Bourgh, E. Bibeau, D. Friesen, W. Franz

CSBE11-132 Capacitive probe for ice detection: Proof of Concept. K. Owusu, D. Kuhn, E. Bibeau

CSBE11-133 Repurposing plug-in electric vehilce batteries to support intermittent renewables. S. Shokrzadeh, E. Bibeau, T. Molinski

CSBE11-134 Multi-renewable energy system for power generation in remote communities. A. Kraj, E. Bibeau, E. Feitosa

CSBE11-135 Investigation of hydrodynamics of mixing in anaerobic digester. D. Asrat, E. Bibeau

CSBE11-136 Kinetic turbine research, demonstrations and development in Manitoba rivers. A. Hossein Birjandi, J. Woods, M. Shahsavarifard, E. Bibeau, T. Molinski

12:00-2:00 Lunch & AGM

Day 1 – Monday, July 11
Technical Session 2

Time: 2:00-3:20 pm

Session 2a **Biogas Production in Ontario**
Location: Ballroom West **Moderator: Danny Mann**

2:00 - 2:20 Innovative aspects of biogas systems. J. DeBruyn (CSBE11-200)
2:20 - 2:40 Influence of regulations on technology design. J. DeBruyn (CSBE11-201)
2:40 - 3:00 Provincial initiatives to support development. J. DeBruyn (CSBE11-202)

Session 2b **Sustainable Agricultural Practices**
Location: Ballroom East **Moderator: Donald Petkau**

2:00-2:20 Drying baled hay with combined solar and biomass heat sources. R. Morissette, P. Savoie (CSBE11-203)
2:20-2:40 Effect of conservation tillage on the soil physical properties and corn yield. S. Afzalinia, A. Karami, M.H. Talati, S.M. Alavimanesh (CSBE11-204)
2:40-3:00 Precision agriculture in the classroom. D. Petkau (CSBE11-205)

Session 2c **Greenhouse Development**
Location: Prairie Salon **Moderator: Kris Dick**

2:00 - 2:20 Biomass energy for supplemental heating in a solar energy greenhouse. Q. Zhang, R. Boris (CSBE11-206)
2:20 - 2:40 Preliminary results of solar energy greenhouse research at the University of Manitoba's Alternative Village. M. Yusim, K. Dick (CSBE11-207)
2:40 - 3:00 Dehumidification in a tomato greenhouse. J. Han, H. Guo, Z. Gao (CSBE11-208)

Session 2d **Renewable Fuels - Biodiesel**
Location: River Salon **Moderator: David Levin**

2:00 - 2:20 Optimization of lipid synthesis for next generation biodiesel. R. Sestric, D. Levin, R. Sparling (CSBE11-209)
2:20 - 2:40 Characterization of canola and flaxseed oil for biodiesel feedstock. A. Rana, S. Panigrahi, K.N. Harker (CSBE11-210)
2:40 - 3:00 Determination of the physico-chemical properties of extracted biodiesel from palm kernel oil. A. F. Alonge, E. Ituen, A. Enyong (CSBE11-211)

Day 1 – Monday, July 11
Technical Session 3

Time: 3:30-5:10 pm

Session 3a **Livestock Buildings / Odour**
Location: Ballroom West **Moderator: Qiang Zhang**

3:30-3:50 Evaluation of engineering and management control measures for improving air quality in swine production. Y. Jin, B. Predicala (CSBE11-300)
3:50-4:10 Annoyance-exposure relation for swine odour. Z. Gao, Q. Zhang, H. Guo, J. Allston, A. La (CSBE11-301)
4:10-4:30 Greenhouse gas emissions from three housing systems for laying hens. S. Fournel, F. Pelletier, S. Godbout, R. Lagacé, J-P Larouche, S. Lemay (CSBE11-302)
4:30-4:50 Controlling gas emissions from swine facilities using zinc oxide nanoparticles. A. Alvarado, B. Predicala (CSBE11-303)

4:50-5:10 Evaluation of the use of heat recovery ventilator and geothermal heating in swine grow-finish rooms. L. Dominguez, B. Predicala (CSBE11-304)

Session 3b Renewable Fuels - Biomass
Location: Ballroom East Moderator: Nazim Cicek

3:30-3:50 Catalytic fast pyrolysis of biomass for the third generation biofuels. L. Wei (CSBE11-305)

3:50-4:10 Radio frequency-alkaline pretreatment of lignocellulosic barley straw. K.L. Iroba, L. Tabil (CSBE11-306)

4:10-4:30 The potential of forage sorghum as a direct combustion biofuel. T. Rennie, A. Tubeileh (CSBE11-307)

4:30-4:50 Direct microbial conversion. V. Agbor, W. Blunt, C. Dartiailh, N. Cicek, R. Sparling, A. Berlin, D. Levin (CSBE11-308)

4:50-5:10 Hydrogen production from delignified wood using cellulolytic bacteria Clostridium termitidis in a bioreactor. U. Ramachandran, N. Cicek, R. Sparling, D. Levin (CSBE11-309)

Session 3c Renewable Energy Issues
Location: Prairie Salon Moderator: Danny Mann

3:30-3:50 Development of a comparative renewable energy decision support tool. D. Roth, S. Shaw, B. Van Heyst, D. Lubitz (CSBE11-310)

3:50-4:10 Energy and environmental impact assessment of biohydrogen production pathways. R. Kabir, A. Kumar (CSBE11-311)

4:10-4:30 Cattail biomass harvesting: a renewable alternative biomass source for bioenergy, phosphorous capture and carbon credits. R. Grosshans, N. Cicek, G. Goldsborough, H. Venema, D. Wrubleski, E. Bibeau (CSBE11-312)

4:30-4:50 Assessment of biomass conversion pathways based on energy and water requirement. S. Singh, A. Kumar, B. Ali (CSBE11-313)

4:50-5:10 Energy evaluation of agricultural and non-agricultural biomass as feedstocks for a horizontal continuous flow gasification/combustion system. L. Dickie and G.W. Price (CSBE11-314)

Session 3d Bioprocessing
Location: River Salon Moderator: Stefan Cenkowski

3:30-3:50 Protein content and antioxidant activity of distiller's spent grains (DSG) dried under different conditions. M. Flores-Alvarez, M.E. Sosa-Morales, S. Cenkowski, J. Paliwal (CSBE11-315)

3:50-4:10 Current and potential applications of distiller's spent grains. P. Johnson, J. Paliwal, S. Cenkowski (CSBE11-316)

4:10-4:30 Drying and physico-chemical characteristics of wheat distiller's grain with solubles prepared from varying WDG:CDS blends. M.R. Mosqueda, L. Tabil (CSBE11-317)

4:30-4:50 Angle of repose of superheated steam dried distillers spent grain. P. Johnson, S. Cenkowski, J. Paliwal (CSBE11-318)

4:50-5:10 Physico-chemical characteristics of wheat distiller's dried grains with solubles sourced from a Saskatchewan ethanol plant. M.R. Mosqueda, L. Tabil (CSBE11-319)

6:00-9:00 Barbeque at FortWhyte Alive – Enjoy dinner in a beautiful natural setting of 600 acres of prairie, lakes, forest and wetlands.

Day 2 – Tuesday, July 12
Tours

Time: 8:00 am - 5:00 pm

Note: Bag lunch provided on tour.

Tour 1

Manitoba Hydro Place: Manitoba Hydro Place, the largest office building in Winnipeg, is a model for superior energy-efficient sustainable design and operation and is expected to use 65 percent less energy than comparable office towers built to current standards.
Eastman Bio-Fuels: This innovative 10 million litre per year bio-diesel production plant utilizes non-food grade canola and recycled waste, fats and greases. The Eastman Bio-Fuels plant is a green business that will positively affect the environment and support the local economy.
Ridgeland Colony Fish Farm: A swine barn was renovated on a colony setting to raise arctic char and process fish.
Pineland Nurseries: Biomass replaces natural gas for space heating for large-scale nursery. A demonstration project at Pineland Forest Nursery in Hadashville is planned to include conversion of biomass to syngas. Waste wood from nearby sources will be converted into a combustible gas then used to power an engine –driven generator on site.
Poultry Solar Wall

Tour 2

Alternative Village – University of Manitoba, Department of Biosystems: Researchers use this outdoor laboratory to research alternative energy technologies and building envelope systems.
Glenlea Research Station – University of Manitoba, Department of Biosystems Engineering: Research is being done at this pilot-scale anaerobic digestion facility, to see if adding a product such as glycerol, having a high caloric value can increase biogas production.
Manitoba Hydro Place: Manitoba Hydro Place, the largest office building in Winnipeg, is a model for superior energy-efficient sustainable design and operation and is expected to use 65 percent less energy than comparable office towers built to current standards.
Red River College: Visit new greenhouses based on the Chinese passive solar design. Demonstrations of ongoing research projects including a bubble insulation to prevent nighttime heat loss as well as different thermal wall technologies. Other highlights include a visit to a concentrated solar power project site and a visit to the Red River College's bio-diesel processing plant.
Water Song Farms – Canadian Model Aqua-Farm Initiative: Visit the sate-of-the-art commercial land-based freshwater aquaculture production system capable of producing 130 tonnes of rainbow trout annually.

6:30 Awards Banquet (Location: Ballroom East & Ballroom West)

Day 3 – Wednesday, July 13
Plenary Session 2
Location: Ballroom West & Ballroom East **Time: 8:00 - 10:00 am**

Introduction of Plenary Speakers
Harvey Chorney

Speaker #1
Eric Bibeau "Achieving 50% Renewables by 2030 in Manitoba"

Eric Bibeau (Ph.D., P.Eng.) is an Associate Professor at the University of Manitoba and holds the NSERC/Manitoba Hydro Chair in Alternative Energy. He specializes in developing power systems using biomass feedstocks, industrial waste heat, and kinetic energy from rivers for distributed energy applications. Dr. Bibeau is also involved in developing blade deicing mitigation strategies for wind turbines. He is developing expertise in electric vehicles and district energy systems as a means to increase the renewable energy ratio in Canada to simultaneously address climate change and peak oil energy drivers.

Speaker #2
Jeremy Langner "Five Bioenergy Demonstration Projects"

Jeremy Langner has been involved in the field of bioenergy since 2006. He received his B.Sc. in Mechanical Engineering in 2006, and his M.Sc. in 2010, both from the University of Manitoba. Jeremy's Master's thesis focused on the effects on non-Newtonian flow in anaerobic digesters; his research also included work in the field of biomass gasification. Jeremy has worked in Renewable Energy as an Engineer-in-Training at Manitoba Hydro since 2009. He is extensively involved in Manitoba Hydro's biomass initiatives, including five demonstration projects for the Power Smart Bioenergy Optimization Program.

Speaker #3
Tom Molinski "The Drivers and Barriers for Emerging Energy Technologies"

Tom Molinski has a BSc and M.Sc. degrees in Electrical Engineering from the University of Manitoba. Tom has worked for Manitoba Hydro for the past 35 years. Tom is currently the Section Head of Emerging Energy Systems in the Power Planning Division. He is responsible for research, planning, concept development, and recommending emerging energy technology projects (like wind, small hydro, bioenergy, energy storage, and various solar technologies) suitable for Manitoba Hydro to implement now or in the future. Tom works with government, various research groups, and several learned societies to determine what are the available emerging energy strategies that Manitoba Hydro can use now and in the future. Tom collaborates on several emerging energy research projects with the University of Manitoba and other organizations.

10:00-10:30 Refreshment Break

Day 3 – Wednesday, July 13
Technical Session 4 **Time: 10:30 - 11:50 pm**

Session 4a **Green Buildings**
Location: Ballroom West **Moderator: Kris Dick**

10:30-10:50 Development of a renewable energy demonstration building to support on-line training. R. J. Baron, T.J. Baron, M. Mathison (CSBE11-400)

10:50-11:10 Load, thermal and moisture behaviour of Manitoba hemp for use in hempcrete wall systems in a northern prairie climate. J. Pinkos, K. Dick (CSBE11-401)

11:10-11:30 Preliminary results of thermal, energy and moisture monitoring of six wall systems. K. Dick (CSBE11-402)

11:30-11:50 Results of a research programme to investigate the load-deformation performance of metal truss plate laminated posts. K. Dick, K. Fedirchuk, J. Pinkos, D. Orchard (CSBE11-403)

Session 4b **Renewable Fuels – Livestock Waste**
Location: Ballroom East **Moderator: Nazim Cicek**

10:30-10:50 Design and commissioning of a pilot-scale solid state anaerobic digester for the Canadian prairies. J. Agnew, P. Lung, B. Lung (CSBE11-404)

10:50-11:10 Anaerobic fermentation of swine manure to increase P removal by struvite precipitation. J. Ackerman, N. Cicek, J. Oleszkiewicz (CSBE11-405)

11:10-11:30 Design of a pilot-scale anaerobic digestor for liquid swine manure. N. Cicek (CSBE11-406)

11:30-11:50 Modelling anaerobic digesters in three dimensions. D.L.F. Gaden, E.L. Bibeau (CSBE11-415)

Session 4c **Livestock Buildings / Odour**
Location: Prairie Salon **Moderator: Qiang Zhang**

10:30-10:50 Evaluation of water use and water conservation strategies available in swine industry. Y. Jin, E. Navia-Richards, B. Predicala (CSBE11-407)

10:50-11:10 Comparative evaluation of radiant and forced convection heaters in grow-finish swine rooms. L. Dominguez, B. Predicala, J. Price, Y. Jin, A. Alvarado (CSBE11-408)

11:10-11:30 Comparison of greenhouse gas emissions from three laying hens production systems based on life cycle assessment. F. Pelletier, S. Fournel, S. Godbout, M. Belzile, S. Lemay, J.R. Feddes (CSBE11-409)

11:30-11:50 Assessing acceptable odour levels. A. La, J. Allston, Z. Gao, Q. Zhang, H. Guo (CSBE11-410)

Session 4d **Renewable Fuels - Biomass**
Location: River Salon **Moderator: Jason Morrison**

10:30-10:50 Harvest of willow plantations under intensive management with a biobaler. P. Savoie, P.L. Hébert, F-S Robert, M. Labrecque (CSBE11-411)

10:50-11:10 Biomass experience at Case New Holland. J. Henry (CSBE11-412)

11:10-11:30 Evaluation of energetic potential of vegetable biomasses. F. Farias, K. Tannous (CSBE11-413)

11:30-11:50 Energy production from direct combustion of agricultural biomass on farm. S. Godbout, F. Pelletier, J. Palacios, S. Lemay, D. Bussieres, P. Brassard (CSBE11-414)

12:00-1:30 **Lunch**

Day 3 – Wednesday, July 13
Technical Session 5 **Time: 1:30 - 3:30 pm**

Session 5a **Processing of Agricultural Fibres**
Location: Ballroom West **Moderator: Donald Petkau**

1:30-1:50 Simulation of hemp decortication using a hammer mill. M. Sadek, Y. Chen, C. Laguë, H. Landry, Q. Peng, W. Zhong (CSBE11-500)
1:50-2:10 CSBE11-501 **Withdrawn**
2:10-2:30 Post-decortication processing of hemp fibre using a carding machine. S. Parvin, Y. Chen, C. Laguë, H. Landry, Q. Peng, W. Zhong (CSBE11-502)
2:30-2:50 Stochastic modeling of hemp fibre-core interface. L. Guzman, Y. Chen, C. Laguë, H. Landry, Q. Peng, S. Potter, W. Zhong (CSBE11-503)
2:50-3:10 Drying characteristics of microwave, microwave-convection, and microwave-vacuum treated flax fibre. A. Tripathy, S. Panigrahi, V. Meda (CSBE11-504)
3:10-3:30 Specific energy consumption for reducing the size of hemp stalk using a ball mill. M.R. Khan, Y. Chen, C. Laguë, H. Landry, Q. Peng, W. Zhong (CSBE11-505)

Session 5b **Renewable Fuels – Ethanol**
Location: Ballroom East **Moderator: Nazim Cicek**

1:30-1:50 Optimizing the debranning of wheat for incorporation in animal feed production. E. George, B. Rentsen, L. Tabil, V. Meda (CSBE11-506)
1:50-2:10 Juice extraction from sweet sorghum and sweet pearl millet for bioethanol production. M. Crépeau, M. Khelifi, A. Vanasse, P. Seguin, G. Tremblay (CSBE11-507)
2:10-2:30 Selection of nutrients to optimize cellulosic ethanol production under high solid loadings. R. Islam, E. Hossain, R. Sparling, N. Cicek, D. Levin (CSBE11-508)
2:30-2:50 In silico analysis of Clostridium termitidis genome for biofuel synthesis pathways. S. Lal, D. Levin (CSBE11-509)
2:50-3:10 Starch analysis and fermentation characteristics of high starch, low protein varieties of winter wheat for bioethanol production. A. Menon, N. Cicek, M. Izydorczyk, A. Brule-Babel, D. Levin (CSBE11-510)
3:10-3:30 Flax shive as a case study biorefining opportunity to support development of second-generation biofuels. R.V. Parsons, S. Cenkowski, E. Liu (CSBE11-523)

Session 5c **Biomass Processing**
Location: Prairie Salon **Moderator: Stefan Cenkowski**

1:30-1:50 Physico-chemical characteristics of densified untreated and microwave-chemical pretreated canola straw grind. M. Kashaninejad, L. Tabil (CSBE11-511)
1:50-2:10 Drying characteristics of forage sorghum. T. Rennie, D. Mercer, A. Tubeileh (CSBE11-512)
2:10-2:30 A comprehensive analysis of the factors affecting densification of barley, canola, oat and wheat straw grinds. P. Adapa, L. Tabil, G. Schoenau (CSBE11-513)
2:30-2:50 Effect of pretreatment and densification on hydrolysis of lignocellulosic barley straw. S. Raamanathan, L. Tabil (CSBE11-514)
2:50-3:10 CSBE11-515 **Withdrawn**
3:10-3:30 Study of hydrodynamic behavior of waste wood in a gas-fluidized bed. A. G. De Mitri, K. Tannous (CSBE11-516)

Session 5d **Bioproducts & Renewable Fuels**

Location: River Salon **Moderator: David Levin**

1:30-1:50	Characterization of PHA synthase genes of Pseudomonas LS46 and construction of recombinant Pseudomonas strains for PHA production. P. Sharma, J. Fu, D. Levin (CSBE11-517)
1:50-2:10	Use of flaxseed oil for biopolymer development. A. Rana, S. Panigrahi, L. Kushwaha, P. Chang (CSBE11-518)
2:10-2:30	A biochemical study of bioproduction of an alditol in a batch system. M. Soleimani, L. Tabil, S. Panigrahi (CSBE11-519)
2:30-2:50	Mining the Clostridium termitidis genome for cellulosomal components. R. Munir, S. Lal, D. Levin (CSBE11-520)
2:50-3:10	Medium chain length Polyhydroxyalkanoates from Pesudomonas LS46. J. Fu, P. Sharma, D. Levin (CSBE11-521)
3:10-3:30	Incorporating real-time analysis with enhanced biofuels production using titrimetric and off-gas analysis (TOGA). M.E. Hossain, W. Blunt, R. Sparling, N. Cicek, D. Levin, D. Gapes (CSBE11-522)