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Preface

Dear JSPS Alumni members and their friends,

This is the sixth JSPS Alumni Symposium and the second multidisciplinary one following last year.

It was during the last year's meeting that Japan experienced magnitude 9.0 earthquake and subsequent tsunami. In addition, we had and still have a nuclear disaster caused by tsunami. The recovery process is not an easy one but we are making an effort in every sector of the society. I visited Sendai, my home town, twice since that time, first right after the earthquake and second half a year later. I was not able to get into certain area which was hit hard by tsunami at the time of first visit but, after half a year later, all the area was open and people were working to get rid of debris here and there. Internationally, we saw all kinds of reactions. Some countries overreacted by evacuating all the diplomatic staff from Tokyo. Some countries decided to abandon nuclear reactors altogether. Each country created its own evacuation zone surrounding Fukushima reactors. There was a huge confusion among the Japanese citizen living in Fukushima. The lack of international communication was responsible for all kinds of misunderstanding.

The world is moving. The news of Japanese disaster was quickly replaced by uprising in North Africa and Middle East. Arab people are struggling now to recover the political power in their own hands. Many Western powers are trying to be friends with the new movements in these oil rich countries. The movement is spreading globally with somewhat different flavor. In particular, American demonstrations are against Wall Street and 1% of the population who control the Wall Street and the country itself. Europe is in big financial trouble which no one predicted just one year ago. It will further deepen and has a danger of drag the world economy down with them. Japan never learned from the past tsunami and past nuclear disaster. US and Europe never learned from Japanese experience of financial disaster in the early 1990's.

We seem to be just overconfident of ourselves.

Hiroataka Sugawara, Ph.D.

Director

Japan Society for the Promotion of Science, Washington Office

Welcome to the 2nd Multidisciplinary Science Forum (MSF)!

Welcome to the 2nd Japan Society for the Promotion of Science US Alumni Association Multidisciplinary Science Forum (MSF).

The purpose of the MSF is to give our fellow members the opportunity to expand network and research collaboration. Japan Society for the Promotion of Science (JSPS) established fellowships that allow former JSPS awardees to return to Japan to their host institutions and further strengthen the bonds of scientific cooperation among our countries.

The 2nd MSF is expanding as well; the Alumni are given the opportunity to nominate “Invited Speakers” from both United States and Japan to be our guest at the Forum. At this time, we are welcoming fellow scientists from China and students from several academic institutions in the United States.

The devastating Tohoku-Pacific Ocean Earthquake and Tsunami happened in March 11, 2011 and took place during the 1st MSF held at University of Washington in Seattle. JSPS Alumni members were overwhelmed and saddened, and wanted to help however we could. We were motivated to donate to aid healthcare workers we knew would be dispatch to support the survivors. Three thousand, five hundred dollars were collected from JSPS U.S. Alumni and sent to the Japan Society of Disaster Nursing. Our efforts to support the Japan Relief will continue during the Forum.

On the behalf of the Executive Committee, I would like to express our deepest gratitude to Prof. Michael Famiano and Prof. Steve Covell, our host fellows at Western Michigan University, for organizing the event and welcoming all of the JSPS community to Kalamazoo.

The Multidisciplinary Science Forum is open to the public. Your presence at the Forum is assuring its success!

Thank you.

Blanca Chattin-Kacouris DDS, PhD
Chairperson
Japan Society for the Promotion of Science
US Alumni Association

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Keynote Lecture

Can Superconductors Help with Environmental and Energy Problems?

Anthony Leggett

Nobel Prize Laureate (2003 Physics)

Can Superconductors Help with Environmental and Energy Problems?

Anthony Leggett

University of Illinois at Urbana-Champaign

At present a fairly substantial fraction of the electrical energy generated in power stations is lost in transmission to the place of consumption, and this fraction is likely to increase as renewables such as solar or nuclear power are increasingly used. If one could find a metal which had zero electrical resistance at ambient temperature and use it in transmission lines, the wasted fraction of the energy could be reduced almost to zero. Such materials -superconductors-do in fact exist, but until 1986 they were thought to show the property of zero resistance only below about one-tenth of room temperature and therefore to be impractical for the grid. However, we now know that superconductivity (zero resistance) can occur up to at least half of room temperature and possibly higher. In this talk I will review what we know about the phenomenon of superconductivity and the prospects for extending it to a point where it can make a practical contribution to energy saving and environmental concerns.

Session 1 - Biology and Medical Science

(Chair: Dawn Doutrich / Blanca Kacouris)

Fnip1, a novel metabolic regulator controlling B lymphocyte development, transformation, and whole-body metabolism

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Heon Park¹, Karen Staehling-Hampton², Mark W. Appleby², Mary E. Brunkow², Mark Tsang¹, Jisun Paik¹, H. Denny Liggitt¹, Tania Habib¹, George Carlson³, and Brian M. Iritani¹.

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Immunodeficiency diseases are often caused by mutations or other genetic alterations that reduce or eliminate the expression genes that control the development of immune cells. Interestingly, mutations that result in over-expression or deregulated expression of the same genes can often result in cancer. We are primarily interested in understanding the cellular and molecular mechanisms govern the development and function of lymphocytes, and how dysregulation of these genes predispose to cancer. Using a chemical mutagenesis screen in mice to randomly induce genetic mutations, we identified a novel mouse pedigree that completely lacks B lymphocytes, due to a non-coding deletion in a novel gene called *Fnip1*, which encodes for Folliculin interacting protein-1 (Fnip1). Fnip1, a cytoplasmic protein of unknown function, was originally cloned based on its interaction with Folliculin and the metabolic regulator AMP kinase (AMPK); a serine-threonine kinase that regulates energy metabolism in many tissues. AMPK acts in part by stimulating ATP production in response to low energy, while shutting off ATP consumption regulated by mammalian target of rapamycin (mTOR). Analysis of *Fnip1*^{-/-} mice reveals a complete block in B cell development at an immature B cell stage that lacks expression of antibody molecules (called pre-B cells). *Fnip1*^{-/-} mice exhibit additional phenotypes reflective of alterations in cell metabolism including resistance to obesity and diabetes when fed a high-fat high-sucrose diet, shift in skeletal muscle fiber types from fast-twitch to slow-twitch, and increased heart size (hypertrophic cardiomyopathy). *Fnip1*^{-/-} pre-B lymphocytes are also resistant to cancer formation in response to overexpression of a specific oncogene called c-Myc. Our hypothesis of how Fnip1 functions will be discussed, as well as important implications for inhibiting Fnip1 in obesity and cancer.

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References:

- (1) Baba et al., (2006) PNAS 103(42):15552-7.
- (2) Hasuma et al., (2008) Gene 415(1-2):60-67.
- (3) Takagi et a., (2008) Oncogene 27(40):5339-47.



Brian Iritani received his doctorate in Veterinary Medicine from Washington State University, and his Ph.D. in Immunology from the University of Washington in Seattle. After completing his post-doctoral training in basic cancer research at Fred Hutchinson Cancer Research Center, Brian became a Faculty member in the Department of Comparative Medicine, University of Washington School of Medicine. Brian's research programs are focused on understanding the molecular and cellular mechanisms which govern the development of lymphocytes, and how these processes become dysregulated in cancer. He is currently Associate Professor of Comparative Medicine, Chief of Veterinary Surgery, and co-Director of training programs.

Scarification Method and Storage Time Affect Hard Seed and Germination of Forage Legumes

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Legumes are important component in the agricultural cropping systems because they can fix atmospheric nitrogen in the soil through nitrogen fixing bacteria and reduce fertilizer cost, improve forage yield and quality, and increase pasture productivity and persistence when mixed with grasses. There is a growing interest among producers in the Central West regions of USA to grow sainfoin (*Onobrychis viciifolia* Scop.), cicer milkvetch (CMV; *Astragalus cicer* L.), and winter annual medic [*Medicago rigidula* (L.) All.] in addition to alfalfa (*M. sativa* L.). However, for many instances, hard seeds and low germination make them difficult to establish in the field conditions. The objective of this study is to reduce hard seed content and improve germination of these forage legumes through seed scarification and storing. Scarification study was conducted on the seeds of three cultivars ('Ranger', 'Ladak', and 'Vernal') of alfalfa, yellow flower alfalfa (*M. sativa* spp. *falcata*), three cultivars each of sainfoin ('Shoshone', 'Eski', and 'Remont') and CMV ('Monarch', 'Oxley', and 'Lutana'), and one cultivar ('Laramie') of winter annual medic. Four scarification methods were utilized in this study: i) heat (60°C in an oven), ii) freeze-thaw (temperature alternations between -80°C and 22°C), iii) acid (soaked in concentrated sulfuric acid), and iv) mechanical (rubbed with a sandpaper) scarification. The experimental layout was a randomized complete design (RCD) with five replicates. The seeds treated with heat and freeze-thaw scarification were stored for eight months at two temperature regimes (22°C and 8°C). Hard seed of all alfalfa and sainfoin seeds was low (0-9%) while germination was high (88-100%) in untreated control indicating no harmful effect of scarification on seed viability of these seeds. Mechanical (20 min) and acid (5 min) scarification decreased hard seed and increased germination of CMV (Monarch: 70 vs. 27% in control to 1 vs. 98%) and medic (Laramie: 23 vs. 77% in control to 1 vs. 99%), respectively. Storing seeds at 8°C reduced hard seed (Monarch: 81% before storing to 49% after storing) and improved germination (Monarch: 11% before storing to 51% after storing) in CMV seeds. No effect was observed in medic seeds after storing (hard seed: 26-33%, germination: 67-74%). Overall, mechanical scarification or storing reduced hard seed and improved germination in CMV, while acid scarification worked best for medic seeds. Details of this study will be discussed at the presentation.



Dr. M. Anowarul Islam is an Assistant Professor and Forage Agroecologist in the Department of Plant Sciences in the College of Agriculture and Natural Resources, University of Wyoming, USA. He has extensive experience on forage and alternative crops in relation to screening, establishment, agronomic management, and production. He can be reached at (307) 766-4151 or at mislam@uwyo.edu. For more information, please

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Rapid loss of MHC class II variation in a bottlenecked population is explained by drift and loss of copy number variation

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Abstract

Population bottlenecks may reduce genetic variation and potentially increase the risk of extinction. Here, we present the first study to use historic samples to analyze loss of variation at the major histocompatibility complex (MHC), which plays a central role in vertebrate disease resistance. Balancing selection acts on the MHC and could moderate the loss of variation expected from drift; however, in a Wisconsin population of greater prairie-chickens (*Tympanuchus cupido*), the number of MHC class II B alleles per individual declined by 44% following a population bottleneck, compared to a loss of only 8% at microsatellites. Simulations indicate that drift likely reduced MHC variation at the population level, as well as within individuals by reducing the number of gene copies per individual or by fixing the same alleles across multiple loci. These multiple effects of genetic drift on MHC variation could have important implications for immunity and fitness.

Biography

I am in the final year of my doctoral work at UW-Milwaukee. I study the genetics of the immune system in birds. Topics include how variation of genes in the major histocompatibility (MHC) complex is maintained, the comparative genetic architecture of MHC in birds and the role of MHC in mating behavior.



Imaging EBV and KSHV-associated tumors *in Vivo*

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Epstein-Barr virus (EBV) and Kaposi's sarcoma herpesvirus (KSHV) are two known human herpesviruses. EBV has been identified in a wide variety of lymphomas and carcinomas. KSHV is associated with Kaposi's sarcoma, primary effusion lymphoma and multicentric Castleman's disease. The two viruses encode kinases that phosphorylate nucleoside analogs such as 2'-deoxy-2'-fluoro-5-iodo-1-beta-D-arabinofuranosyluracil (FIAU). We hypothesized that it might be possible to use the viral enzyme to concentrate [¹²⁵I]FIAU specifically within tumor cells harboring virus and thus deliver imaging and therapeutic radiation. *In vitro*, we found that bortezomib (Velcade) is a potent stimulator of viral kinase expression in EBV and KSHV tumor cell lines. Cell uptake assays with [¹⁴C] FIAU and *ex vivo* bio-distribution studies with [¹²⁵I]FIAU showed that uptake and retention of [¹²⁵I] FIAU is highly specific for cells that are EBV and KSHV positive upon lytic infection but not when virus is in the latent state. Planar gamma imaging and SPECT/CT imaging with [¹²⁵I]FIAU of tumor-bearing SCID mice showed selective concentration of radiotracer in tumor tissue in KSHV-associated tumors when animals were pretreated with the bortezomib. That effect was demonstrated in xenografts derived from EBV (+) human lymphoma and gastric cancer cell lines as well as KSHV (+) primary effusion lymphoma. We found dramatically increased [¹²⁵I]FIAU uptake within EBV (+) and KSHV (+) tumors at 96 hours after injection of [¹²⁵I]FIAU. These results indicate that treatment with bortezomib leads to selective concentration of radiolabeled FIAU in the EBV and KSHV-associated tumor xenografts and may provide a simple way for the localization, monitoring and therapy of EBV and KSHV-associated tumors that could be translated to the clinic.

Reference

1. Fu D, et al., Nature Medicine, 2008; 14(10):1118-22
2. Fu D, et al., Clinical Cancer Research. 2007; 13(5):1453-1458.
3. Fu D, et al., Current Pharmaceutical Design. 2008;14(28):3048-65.
4. Zhou J, Fu D, et al., Nature Medicine. 2011;17 (1)130-134

Potential chemo-preventative activities of *Momordica charantia* L.

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Many exotic vegetables are known for their special nutritional and medicinal properties. Bitter Melon (*Momordica charantia* L.) is found to be one of the important vegetables of special nutritional and medicinal qualities in southern United States. The popular belief of bitter melon to improve glucose tolerance in Type II diabetes and lower blood cholesterol are being investigated. It is still to be determined if the chemical constituents such as certain alkaloids and polypeptides found in bitter melons are effective individually or in combination. The total phenolic contents of the oven-dried and freeze-dried tissues and seeds ranged from 5.39-7.75, 6.72-8.02, 6.40-8.90, and 4.67-6.69, mg/g on dry weight basis. The main phenolic acids in bitter melon flesh were gallic acid, gentisic acid, catechin, chlorogenic acid, and epicatechin. Bitter melon seeds had the phenolic acids, gallic acid, catechin, and epicatechin. The antioxidant activities of methanolic extracts ranged from 79-85, 79-83, 80-85, and 79-86% inhibition, respectively. The antioxidant activities of the seed ranged 79-84% inhibition. Methanolic extracts of freeze-dried flesh and seed from IW and CG showed very high antimutagenic effects against benzo(a)pyrene with *Salmonella* TA98 (92-100% inhibition) TA100 (79-86% inhibition), but lower antimutagenicity activities against sodium azide that ranged from 46-54 and 17-32% inhibition, respectively. Along with the potential chemo preventative activities, the popular belief of bitter melon improving glucose tolerance in Type II diabetes and lowering blood cholesterol are being investigated.

Results and Discussion

Overall, phenolic content in oven-dried samples were significantly higher than freeze-dried samples. Phenolic contents of the oven dried and freeze-dried tissues ranged from 5.39-8.94 mg of chlorogenic acid equivalent (CAE)/g dry matter and 4.64-8.90 mg/CAE.g dry matter, respectively (Table 1).

Table 1. Total phenolic contents of bitter melon tissues (mg/g dry matter)

Varieties	Oven-dried			Freeze-dried		
	Flesh	SCT**	Seed	Flesh	SCT**	Seed
Indian Green	6.5 ±0.06c	6.8 ±0.12b	6.7 ±0.08b	6.4 ±0.06d	4.6 ±0.10d	4.7 ±0.02c
Indian white	7.1 ±0.12b	8.9 ±0.36a	8.0 ±0.02a	7.2 ±0.04c	7.9 ±0.09a	6.0 ±0.05b
China Green	5.4 ±0.06d	7.0 ±0.07b	7.7 ±0.05a	7.8 ±0.14b	5.7 ±0.25c	6.2 ±0.02b
China White	7.8 ±0.07a	6.1 ±0.16c	6.9 ±0.31b	8.9 ±0.09a	6.6 ±0.23b	6.7 ±0.19a

*Values are means ±SD of three determination, ** SCT= Seed coat tissue; Mean with different letters in the same column are significantly different ($p < 0.05$).

Phenolic contents of seed, SCT, and flesh ranged from 4.67-8.02, 4.64-8.94, and 5.36-8.90 mg/CAE dry matter, respectively. Phenolic contents of the flesh were significantly

higher than those of the SCT and seed and phenolic contents of the seed was the lowest among those of all the tissues.

Antioxidant activities and Antimutagenicity of bitter melon extract.

The antioxidant activities of the oven-dried samples and the freeze-dried samples were 79-88% and 79-86% inhibition, respectively (Table 2).

Table 2. Antioxidant activities (% inhibition) of melon tissues.

Varieties	Oven-dried			Freeze-dried		
	Flesh	SCT**	Seed	Flesh	SCT**	Seed
Indian Green	82 ±3.8a	88 ±0.4a	85 ±2.7a	84 ±1.6a	86 ±0.8a	79 ±1.6b
Indian white	83 ±2.7a	87 ±1.1ab	79 ±1.2b	83 ±2.0a	86 ±0.5a	83 ±1.0ab
China Green	84 ±2.0a	81 ±1.4c	85 ±0.7a	84 ±0.8a	86 ±1.2a	80 ±1.0ab
China White	87 ±2.0a	84 ±2.6bc	79 ±2.6b	84 ±0.1a	83 ±1.0ab	84 ±0.9a

*Values are means ±SD of three determination, ** SCT= Seed coat tissue; Mean with different letters in the same column are significantly different ($p < 0.05$).

Islam et al, (2011) reported that bitter melon extracts possess potent antioxidant and free radical scavenging activities. These antioxidant activities could have contributed, at least partly, to the therapeutic benefits of the certain traditional claims of wild BM. Bitter melon varieties IW and CG showed higher antimutagenic effects against benzo(a)pyrene with *Salmonella* TA98 (92-100% inhibition) and *Salmonella* TA100 (79-86% inhibition) (Table 3) but lower antimutagenic effects against sodium azide (data not shown).

Table 3. Antimutagenic activities (% inhibition) of methanolic extracts from bitter melon against benzo(a)pyrene with *Salmonella* stains TA98 and TA100

Bitter Melon extracts	TA98	TA100
China Green flesh	99.3	86.2
China Green flesh	91.7	81.5
India White seed	100	78.7
India White seed	100	80.9

*Values are mean of duplicate determination; Concentration of extract: 500 µg/plate; benzo(a)pyrene and sodium azide (10 µg/plate).

Although the exact mechanism of the chemo preventive effects of bitter melon is not yet known, these findings suggest that bitter melon is a possible chemo preventive agent against carcinogenesis. Therefore, it may be conclude that bitter melon is an excellent source of phenolic compounds, antioxidant and antimutagen. This can find application in food products, and dietary supplements. The phenolic extracts showed high inhibition effect to Prevent lipid oxidation. These natural plant phenolics can be a good antioxidant which may be applied in many food systems to maintain the food quality.

Reference

Islam, S., Jalaluddin, M. and Hettiarachchy, S. 2011. Bio-active compounds of bitter melon genotypes (*Momordica charantia* L.) in relation to their physiological functions. *Functional Foods in Health and Disease*. 2:61-74.

Childhood Social Position, History of Non-Communicable Disease of Hypertension, Heart Disease and Diabetes Mellitus on Risk of Incident Stroke: A Dynamic Path Analysis

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OBJECTIVES

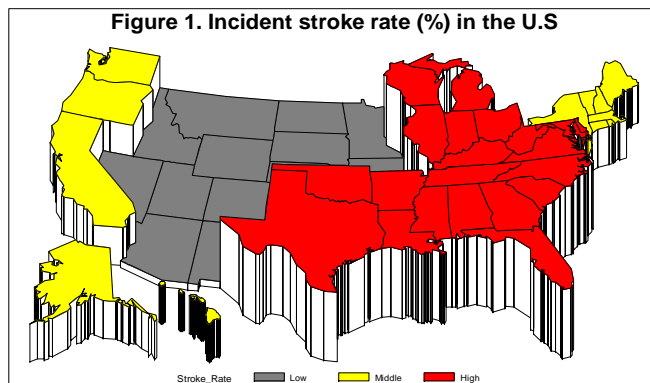
Stroke is the third leading cause of death in the United States and other developed countries. To test the hypothesis that exposure to disadvantage social economic environment at early life and being chronic conditions at adulthood significantly predict risk of the development of stroke in later life.

METHODS

Data from the Health Retirement Study, a nationally representative longitudinal study in the US, was analyzed. Participants aged 50 years and older (n=24,064), recruited between 1992 and 2008 who had no stroke were followed on average 9.7 years. Stroke incidence was defined as self-report of a physician-diagnosis of first stroke. A sum index of social position in childhood was created using parents' education level, a lower score indicating poorer social position. Participants' health status at baseline was assessed including body mass index, blood pressure, heart disease and diabetes mellitus. Associations of childhood social position and chronic conditions in adulthood with risk of first incident stroke were examined prospectively using multivariate Cox's regression models.

RESULTS

Within the follow-up period, a total of 2,358 first stroke incident cases were diagnosed. African Americans had the highest incidence rate (11.3%), followed by White (9.87%), Hispanic (7.35%), and others (6.62%). Subjects living in Middle West of the US had highest incidence rates (Figure 1). Multivariate Cox's models indicated that poor social position in childhood, and worse health conditions in adulthood significantly predicted risk of incident stroke. The relative risk (95%CI) of sum index of parents education level (low vs.



high) and participants' education level (<9 yrs), and having pre-existing chronic conditions of hypertension, coronary heart disease and diabetes for risk of incident stroke were 1.56 (1.25-1.95), 1.32 (1.15-1.52), and 1.50 (1.37-1.64), 1.63(1.46-1.81), and 1.95 (1.73-2.19) respectively.

CONCLUSIONS

The findings support the study hypothesis that early childhood experience and history of non-communicable disease conditions significantly predict the risk of incident stroke. This finding highlights the importance of control of stroke at early stage and prevention of chronic conditions.

Bio: Dr. Longjian Liu received JSPS Fellowship Awards in 1998 and 2007. He participated in the study of Japan National Integrated Project for Prospective Observation of Non-communicable Disease And Its Trends in the Aged (NIPPON DATA) and worked under the direction of Professor Hirotsugu Ueshima, MD, PhD, Shiga University of Medical Sciences, Shiga Japan.

Gimap/GTPase family is highly expressed in the lymphoid organs of the Bio-Breeding Rat

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Positional cloning of the lymphopenia (lyp) gene in diabetes prone (DP) Bio-breeding (BB) rats revealed a frameshift mutation in the Gimap5 (GTPase of immunity associated protein)(formerly called Ian5) a member of at least six other related genes comprising the Gimap family expanded in 150kb on rat chromosome 4q24. To characterize this gene family and understand how it may function in lymphopenia and diabetes development, we cloned and sequenced each of the seven rat Gimap genes from our congenic BBDR.lyp line, both from the +/+ and the lyp/lyp rats. Several amino acid differences in this gene family were found between +/+ and lyp/lyp rats. In addition to the mutation in lyp/lyp rats in Gimap5 that causes a frameshift and premature truncation of the protein, Gimap1 from lyp/lyp rats has a threonine at position 251 instead methionine, and Gimap4 from lyp/lyp rats has a frameshift of three amino acids from the C terminus that results in a protein that is 18 amino acids longer than in the +/+ rats. RNA expression analyses by quantitative real-time PCR, from each of these genes revealed unexpectedly, that in spleen and mesenteric lymph nodes the T cell subsets in each of the seven Gimap genes were reduced in the lyp/lyp compared with +/+ rats, even though only the mutation in Gimap5 is linked to lymphopenia and diabetes. To characterize further the specific cell types that show this coordinate regulation, we analyzed the Gimap gene expression in the thymus, spleen and mesenteric lymph nodes in sorted T CD4+, CD8+ cell subsets and the T (CD45+CD45RA-) and the B (CD45+CD45RA+) cell subsets in peripheral lymphoid organs. The entire Gimap family was found to be down-regulated in the periphery of these cell subsets of the lyp/lyp compared with +/+ rats. Our data suggest that RNA Gimap gene family expression is controlled by the absence of the Gimap5 protein in the BB rat.

Session 2 – Chemistry

(Chair: Ying Hu)

Improving Human Nutrition From the Ground Up: Linking Agriculture to Human Health

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Malnutrition is the leading cause of death globally. Both overt nutrient deficiencies and diet-related chronic diseases account for over 20 million deaths a year. The causes of malnutrition are complex but are rooted in dysfunctional food systems dependent on agricultural systems that have never had an explicit goal of improving human health. These deaths are preventable. Linking agricultural systems to human health could provide sustainable solutions to malnutrition. Various agricultural tools can be used to improve the health and felicity of people afflicted with malnutrition.

Biofortification is one tool that is currently being employed to address micronutrient malnutrition among resource-poor families in the developing world. Fertilizers provide another tool that has been used successfully to address selenium, iodine and zinc deficiencies in several nations. There are numerous other “off the shelf” agricultural tools that could be used to improve the nutrient output of farming systems and improve the health all people dependent on agricultural systems for their sustenance. These include: designing cropping systems to maximize nutrient output, using agronomic practices to improve the nutritional and health promoting quality of food crops, re-diversifying cropping systems, and genetically modifying crops to be more nutritious and healthy. This can only be accomplished if explicit links are made between the agriculture, nutrition and health communities. Further, government policies should be reoriented to reflect the important roles that agriculture plays in the health of all people. We need to closely link agriculture to health if we want to find sustainable solutions to malnutrition globally.



Dr. Ross Welch was a plant physiologist at the USDA-ARS, Robert W. Holley Center for Agriculture and Health in Ithaca, New York (retired). He is a Professor (Courtesy) of Plant Nutrition in the Department of Crop and Soil Sciences at Cornell University. He received his B.S. degree in soil science from California State Polytechnic University, San Luis Obispo, CA in 1966 and his M.S. (1969) and Ph.D. (1971) degrees in Soil Science/Plant Nutrition from the University of California at Davis, CA. He is a Fellow of the American Society of Agronomy and the Soil Science Society of America. He is also a Guest Professor at Zhejiang University in Hangzhou, China.

Determination of Luteolin and Apigenin in Dietary Supplements by HPLC with PDA-UV Detection

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Dietary supplements are complex products in terms of quality, safety and efficacy. The Food and Drug Administration (FDA) recently regulates dietary supplements under cGMP Final Rule, 21 CFR Part 111.¹ This cGMP rule establishes quality standards on dietary supplements to ensure their identity, purity, strength, and composition. These standards are designed to prevent the inclusion of the wrong ingredient, the addition of too much or too little of an ingredient, the possibility of contamination, and the improper packaging and labeling of a product. The cGMP requires laboratory examination and testing methodologies that are appropriate for their intended use. An appropriate scientifically valid method must be used for each established specification for which testing or examination is required to determine whether the specification is met.

Luteolin and Apigenin are natural bioflavonoids widely used in dietary supplements. These natural bioflavonoids are of considerable interest to human health as these serve as antioxidant and anticancer agents.²⁻⁵ However, no scientifically validated method for determination of Luteolin and Apigenin in dietary supplements by HPLC is currently available.² We, therefore, disclose herein the in-house method development and its validation for rapid analysis of Luteolin and Apigenin in dietary supplements by HPLC with PDA-UV Detection.

Luteolin and Apigenin contents in dietary supplements were determined using reversed phase HPLC. C₁₈ was used as the packing material and the mixture of 0.01 M phosphate buffer (pH = 2), tetrahydrofuran, isopropanol (70:30:5) as the mobile phase with PDA detection wavelength 360 nm. The recovery of the method was 96.5%-101.9%, and the assay was linear at concentrations from 5 to 250 microgram/mL (r = 0.9998). This analytical method could be used in the quality control laboratory for rapid analysis of Luteolin and Apigenin in dietary supplements and is appropriate for their intended use.

References

1. 21 CFR PART 111 Final Rule: [Current good manufacturing practice in manufacturing, packaging, labeling, or holding operations for dietary supplements](#), June 25, 2007.
2. *Pharmazie*, 2005, Sep; 60(9): 648-9
3. *Mol Cancer*. 2011, Aug 29;10(1):104.
4. *J Neurosci Res*. 2011 Jul 28.
5. *Int J Cancer*. 2011, Jul 25.



I have been working in Innovative Labs, LLC as a Director of R&D and Quality since 2006 to present. I obtained my PhD degree from Kyushu University, Japan in 2002 and awarded for JSPS Postdoctoral Fellowship at Kochi University, Japan from 2002 to 2004. Then I joined in a research group of Dr. James C. Fishbein at the University of Maryland, Baltimore county as a postdoctoral research associated from 2004 to 2006. My research focused on organic reaction mechanism, novel boron cationic reaction in solution, synthesis of anti-cancer agents and cancer chemopreventive action of dithiolethiones. Currently, I am particularly interested in developing analytical methods and their validation on dietary ingredients as well as dietary supplements.

Kaempferol in Red and Pinto Bean Seed (*Phaseolus vulgaris L.*) Coats Inhibits Iron Bioavailability Using an *in Vitro* Digestion/Human Caco-2 Cell Model

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Four different colored beans (white, red, pinto, and black beans) were investigated for factors affecting iron bioavailability using an *in vitro* digestion/human Caco-2 cell model. Iron bioavailability from whole beans, dehulled beans, and their hulls was determined. The results show that white beans contained higher levels of bioavailable iron compared to red, pinto, and black beans. These differences in bioavailable iron were not due to bean-iron and bean-phytate concentrations. Flavonoids in the colored bean hulls were found to be contributing to the low bioavailability of iron in the non-white colored beans. White bean hulls contained no detectable flavonoids but did contain an unknown factor that may promote iron bioavailability. The flavonoids, kaempferol and astragalín (kaempferol-3-*O*-glucoside), were identified in red and pinto bean hulls via HPLC and MS. Some unidentified anthocyanins were also detected in the black bean hulls but not in the other colored bean hulls. Kaempferol, but not astragalín, was shown to inhibit iron bioavailability. Treating *in vitro* bean digests with 40, 100, 200, 300, 400, 500, and 1000 μ M kaempferol significantly inhibited iron bioavailability (e.g., 15.5% at 40 μ M and 62.8% at 1000 μ M) in a concentration-dependent fashion. Thus, seed coat kaempferol was identified as a potent inhibitory factor affecting iron bioavailability in the red and pinto beans studied. Results comparing the inhibitory effects of kaempferol, quercitrín, and astragalín on iron bioavailability suggest that the 3',4'-dihydroxy group on the B-ring in flavonoids contributes to the lower iron bioavailability.

Keywords: Iron bioavailability; bean; polyphenols; flavonoids; kaempferol; astragalín; quercitrín; phytate; Caco-2 cell; *in vitro* digestion; HPLC-MS

Reference:

The work was published in *J. Agric. Food Chem.*, **2006**, *54* (24), pp 9254–9261:

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Session 3 - Engineering

(Chair: Ranil Wickramasinghe)

Patterns of the Divine and Patterns by Design--Research Collaboration in Pattern Formation

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This talk will present recent research that is being pursued in collaboration with Japanese and French scientists in the field of pattern formation. Natural occurrences of Nature's patterns can be seen in Fingals caves, in honey combs, on dried lakebeds and in mountains created from frozen lava. The reasons for seeing patterns are traced to competition between forces and also to positive feedback from events caused by forces. Engineers are interested in patterns as they affect the behavior of physical phenomena. Operating conditions can also be tuned to change patterns and even eliminate them. In this talk I will discuss some of nature's patterns and move on to specific research ideas that are being developed in collaboration with Japan and France.



Bio: Professor Ranga Narayanan is currently the Dunlevie Professor in the Dept. of Chemical Engineering at the University of Florida in Gainesville. He directs an NSF PIRE center in Multiphase Flows that emphasizes collaboration with Japan and France in the field of Patterns and Instabilities. He was a Humboldt, Fulbright and JSPS Fellow in 1989, 2001 and 2009 and has recently received a Fulbright Distinguished Chair Fellowship for Israel. He is a co-author of a book on "Interfacial Instabilities" published by Springer Verlag (2002).

Evaluation of Non-Viral Gene Delivery Methods on Human Umbilical Cord Mesenchymal Stromal Cells

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Primary human cells are notoriously difficult to transfect via non-viral methods; however, significant advancements in electroporative technologies over the past decade may provide new opportunities for *ex vivo* tissue engineering. Human umbilical cord mesenchymal stromal cells (hUCMSCs) are a unique type of stem cell that have been shown to be a promising candidate cell source for tissue engineering applications.¹ Electroporative technologies such as Nucleofection™ by Amaxa and Neon™ by Invitrogen may provide viable alternative approaches to lipofection for introducing genes into cells for tissue engineering. *However, despite the improvements in electroporative technologies the literature lacks a comprehensive evaluation of these next generation technologies. Thus, in this study, we set out to compare Nucleofection™ and Neon™ to lipofection, by evaluating the following parameters regarding transfection of hUCMSCs: quantitative level of gene expression, duration of gene expression, cell viability, and cell proliferation.* The purpose behind this study is to assess the strengths of each respective transfection method for *ex vivo* tissue engineering.

Reference:

1. Wang *et al.*, “A Comparison of Human Bone Marrow Derived Mesenchymal Stem Cells and Human Umbilical Cord Derived Mesenchymal Stromal Cells for Cartilage Tissue Engineering,” Tissue Engineering Part A, 2009
2. Wang *et al.*, “Musculoskeletal tissue engineering with human umbilical cord mesenchymal stromal cells,” *Regenerative Medicine*, 2011

Detoxification of lignocellulosic biomass by membrane extraction – experimental observations and theoretical verification

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Production of grain based ethanol (mainly corn) has increased dramatically in the United States. With the continued growth of the bioethanol industry, the demand for corn has increased leading to competition between corn production for food and fuel. It is essential to develop lignocellulosic biomass as an alternative source for transportation fuels.

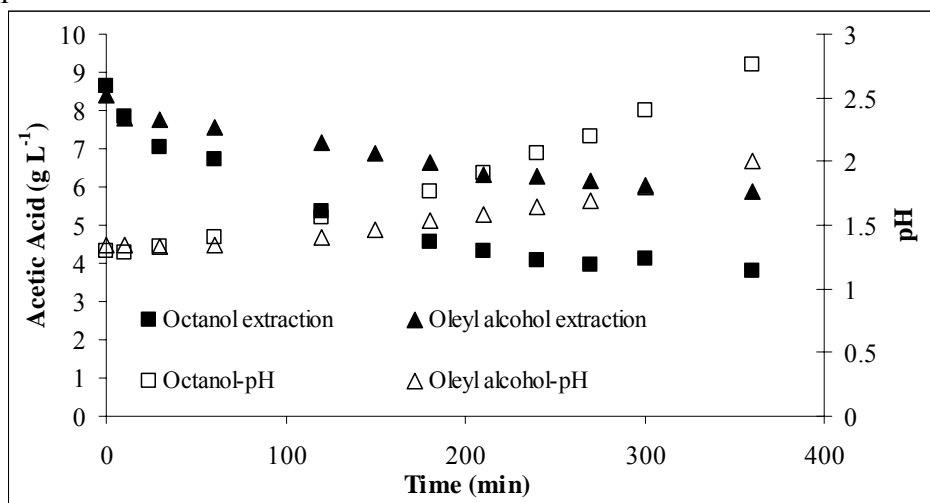
The biochemical conversion of lignocellulosic biomass involves depolymerization of the hemicelluloses and cellulose into monomer sugars, which are then fermented to biofuels such as ethanol. Dilute sulphuric acid has been shown to effectively hydrolyze hemicellulose during pretreatment and make cellulose amenable to enzymatic conversion. During pretreatment, compounds that are toxic to the microorganisms used during fermentation (aliphatic acids, furans and phenolics) are produced that inhibit subsequent bioconversion of the solubilized sugars to the desired products. Removal of these toxic compounds is essential to maximize ethanol yield.

We have detoxified cornstover based lignocellulosic biomass hydrolysates using hollow fiber membrane extraction. Non-dispersive membrane extraction offers numerous advantages over conventional extraction including independent variation of the phase flow rates, a large interfacial area for mass transfer and easy scale up. Figure 1 shows a typical result. Hydrolysate was pumped inside polypropylene hollow fibers (LiquiCel Membrane Contactor, Membrana, Charlotte, NC) while the organic phase was pumped outside the fibers. The organic phase consisted either of 15% Alamine 336 (water insoluble tri-octyl/decyl tertiary amine) in octanol or oleyl alcohol.

The left hand side y axis gives the decreases in acetic acid concentration while the right hand side y-axis gives the increase in pH as a function of extraction time. Since the hydrolysate is pretreated using 1% sulphuric acid the initial pH is around 1-2. The increase in pH during extraction indicates that both sulphuric acid and acetic acid are removed. We have also investigated removal of other aliphatic acids (formic, levulinic), furans such as furfural and 5-hydroxymethyl fuufural (HMF) and phenolics. While all of these compounds are extracted the mechanisms of extraction are different. HMF and furfural are extracted due to the formation of complexes between the furans and amine. Weak acids are extracted due to both complex formation with amine and acid-base reactions. Extraction of sulphuric acid is due entirely to acid-base reaction. Consequently the choice of the organic solvent (octanol versus oleyl alcohol) can impact the level of extraction for a given amine concentration. The complex formation mechanisms and free

energies for extraction were determined using quantum mechanical calculations. These results could be used to help optimize solvent and extraction conditions.

Finally the economic viability of future biorefineries depends critically on maximizing bioethanol production. Table 1 compares ethanol yields for the same hydrolysates for various combinations of membrane extraction using different organic phases as well as conventional ammonium hydroxide treatment. As can be seen membrane extraction by itself with an optimized solvent offers the promise of higher ethanol yields and potential recovery of the extracted compounds. Recovery of aliphatic acids such as acetic acid could result in the production of valuable byproducts. Experimental and modeling results will be presented.



Acetic acid extraction using a LiquiCel Membrane Contactor with 15 % w/w Alamine 336 in either octanol (squares) and oleyl alcohol (triangles) as the organic phase. Corresponding pH values are represented with open symbols.

Membrane extraction	Ammonium hydroxide	Solvent Used in Membrane Extraction	Max. Ethanol Yield	Max. Ethanol Conc. (g/L)	Max. Ethanol Prod. (g/(L•h))
Control			0.91	51.01	4.98
Y	Y	Oleyl alcohol /15% Alamine (w/w)	0.85	46.88	4.75
Y	N	Oleyl alcohol /15% Alamine (w/w)	0.83	46.38	4.94
Y	N	Oleyl alcohol no Alamine	0.80	42.05	3.62
N	Y	Conventional ammonium hydroxide treatment only	0.76	45.89	2.54
N	N	Neutralization to pH 5.7 only	0.54	35.34	1.09
Y	Y	Octanol /15% Alamine (w/w)	0.04	9.96	0.14
Y	N	Octanol /15% Alamine (w/w)	0	0	0

Ethanol yields for various detoxification procedures

Examination of Commercial Anion-Exchange Membrane Adsorbers for Use in Biopharmaceutical Drug Purification

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Biopharmaceutical drug products accounted for an estimated \$93 Billion in sales in 2007. The greatest cost incurred during new biopharmaceutical drug development is the purification of said new drug. Adsorptive membranes have been proposed, and in some cases implemented, as an alternative to packed-bed chromatography columns currently used as the standard for protein purification in the biopharm industry. Microporous membrane adsorbers have several benefits over packed-bed columns such as: 1. Convective transport of solutes to binding sites whereas packed-beds are diffusion limited, 2. Lower pressure drops enabling faster flow rates and processing times, 3. Larger pores for binding of larger species (such as virus particles) which can not penetrate the small pores in packed-bed beads.

We have examined three different commercially available anion-exchange membranes: Sartobind Q from Sartorius, Mustang Q from Pall, and the ChromaSorb from Millipore. Impurities included in this study were: Minute Virus of Mice, CHO Host Cell Protein and DNA. We have determined differences in impurity clearance potential based on differences in binding ligand as well as linkage chemistries. We have attempted to explain these differences in clearance performance by correlation with the separate binding ligands and chemistries associated with the membrane adsorbers. We have generated a qualitative model showing which ion-exchange design variables (such as pH, ionic strength, or flow rate) have the greatest impact on each membrane adsorber's impurity removal potential, as well as attempted to describe why the individual membrane adsorber's are impacted differently by each design variable. This study will aid biopharmaceutical companies' selection of membrane adsorbers as well as contribute to the development of improved anion-exchange membrane adsorbers.

Session 4 – Math and Physics

(Chair: Shamim M. Mirza and Michael Famiano)

Cosmology and the Formation of Elements in the Early Universe

Toshitaka Kajino

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Recent progress in observational cosmology has shown that the total universal energy density consists of unknown 73% dark energy (Ω_Λ) and 23% dark matter (Ω_{DM}) with a tiny fraction of 4% baryonic matter (Ω_B). Precise measurements of the cosmic microwave background anisotropies indicate that our universe is most likely flat, i.e. $\Omega_\Lambda + \Omega_{DM} + \Omega_B = 1$, and the magnitude-redshift relation of Type Ia supernovae strongly suggests that the cosmic expansion is accelerating. It is undoubtedly one of the biggest challenges in modern physics and astronomy to study the nature of these unknown dark energy and dark matter.

We first discuss that fine tuning problem of Ω_Λ may be removed by assuming higher dimensional space-time structure in brane world cosmology that allows mass-energy exchange of dark matter particles as well as gravitational interactions between bulk dimension and 4D Einstein universe. We show that our cosmological model with $\Omega_\Lambda=0$ explains accelerating cosmic expansion as good as the standard Λ -CDM model does with finite Ω_Λ . We second discuss that in the context of a unified theory of supersymmetry for the four fundamental interactions, gravitino could be a dark matter particle which is the super partner of graviton. In this scenario the next lightest supersymmetric particle like stau, which is the super partner of tau lepton, can catalyze exotic nuclear reactions to produce ${}^6\text{Li}$ at extremely high abundance level as recently observed in metal-deficient halo stars before it decays. The standard big-bang nucleosynthesis model predicts three orders of magnitude smaller ${}^6\text{Li}$ abundance. We find a solution to this discrepancy in the present dark matter scenario.

The early universe at the epoch of galaxy formation is expected to show enormous activities of supernova explosions and gamma-ray bursts. They are associated with intensive flux of energetic neutrinos. We thirdly study the supernova nucleosynthesis induced by neutrino interactions. Several neutrino-process elements are strongly affected by the matter (MSW) effects of neutrino flavor oscillation. We here propose a new method to determine the unknown neutrino oscillation parameters, θ_{13} and mass hierarchy, from the supernova nucleosynthesis.

We discuss interdisciplinary implication and synergy among cosmology, particle physics, and nuclear astrophysics in the present talk.



Toshitaka Kajino is a Professor of Astronomy and Astrophysics at National Astronomical Observatory of Japan, and the University of Tokyo. He is a Fellow of the American Physical Society. His current research interests include big-bang cosmology, nucleosynthesis, supernova explosion, and neutrino physics. He has made significant contributions to our understanding of the origin of elements in primordial and supernova nucleosyntheses.

Carbon Nanotube Based Thermoelectric Device

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Carbon nanotubes (CNT) are unique nanostructured materials with remarkable physical and mechanical properties. These properties have inspired interest in the use of CNT for different purposes, e.g. nanosensors, electronic devices, thermal devices, photonics, optoelectronics, biological applications, and polymer nanocomposites. This work is emphasizing two new points which makes nano-electronic junction a closer reality: 1) single-wall carbon nanotubes (SWNTs) were wrapped by polymer and 2) SWNTs were aligned in a polymer matrix. Alignment of carbon nanotubes (CNT) is an open challenge since it discovered in 1991. SWNTs were wrapped using two separate polymers to obtain desired *p*-type and *n*-type characteristics. Wrapped SWNTs were drop cast on glass/Si substrate and applied an external force for ~2 min. Samples were used to characterize after the solvent completely dry out. Degree of alignment was inspected by Scanning Electron Microscope (SEM) and Polarized Raman Spectroscopy and exhibited clear alignment (~90%) at the nano-scale. These results reveal that this is a novel technique to align CNTs in a polymer matrix as well as other nanoparticles or nanowires at large scale. We have also fabricated *p-n* junction using the wrapped SWCNTs. Both current voltage (I-V) curve and thermoelectric characteristics were assessed. I-V curves exhibit behavior, which is similar to its ideal semiconductor counterpart. The thermoelectric, i.e., temperature vs. voltage curves show a linear relation between them for both increasing and decreasing process as an ideal semiconductor diode. On the basis of this result it can be used as a thermal device as well as for various applications.



Dr. Shamim Mirza received his B.Sc. degree in Physics and M.Sc. degree in Solid State Physics and Electronics from Rajshahi University, Bangladesh. He earned Master of Philosophy (M.Phil.) in Solid State Physics from Bangladesh University of Engineering and Technology and his Ph.D. in Material Science from Shizuoka University, Japan in 2002. Now he is a Research Scientist at a high-tech company (Luminit, LLC, Torrance, CA). His research interest is in the field of nanotechnology such as electronic, photonic, optoelectronic devices, solar/photovoltaic cells, and etc. He has authored and coauthored over 50 scientific publications including journal papers, conference proceedings, book chapter, and patents.

Max-plus analysis on some particle cellular automata

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Cellular automata (CA's) are discrete models studied in physics, chemistry, biology, and computer sciences. In this presentation, as an example, we will first show the application of Elementary Cellular automata rule-184 in traffic flow. Then, we are concerned with a special class of binary cellular automata, i.e. the so called article cellular automata (PCA) with four neighbors. We first propose max-plus expressions to PCA of four neighbors. Then, by utilizing basic operations of the max-plus algebra and appropriate transformations, we solve several PCA-4 exactly and obtain their general solutions in terms of max-plus expressions. Finally, we analyze the asymptotic behaviors of general solutions and prove the fundamental diagrams exactly.

Dr. Baofeng Feng received his B. S. in physics and applied mathematics from Tsinghua University, China. He received his M. S. in informatics engineering from Nagoya University, Japan, in 1997 and earned his Ph. D. in aeronautics and astronautics engineering from Kyoto University, Japan, in 2000. He was awarded a short-term JSPS research fellow to visit department of mechanical engineering, Osaka University, in the summer of 2007. He is currently an associate professor at department of mathematics, the University of Texas-Pan American.

Session 5 - Social Science and Humanities

(Chair: Dajin Peng and Stephen G. Covell)

International Developments in Religion & Education: Contexts and Controversies

Michael D. Waggoner

University of Northern Iowa

The topic of religion and its relative place in education, whether public or private, has long been part of the discourse anywhere societies have grappled with their collective purposes. The urgency surrounding these discussions increased significantly in the aftermath of the World Trade Center attacks of 2001 where political motivations seemed to be fueled by religious underpinnings, knowledge of which seemed thin, at least in the United States. The steady but small stream of research on religion and education that had existed for decades began to swell as many awakened to religion's role in globalization. How this was addressed by scholars and interested lay parties varied around the world depending upon their contexts. The editors and board of the journal, *Religion & Education*, were in a particularly privileged place to observe these developments and served as one venue to help moderate the scholarly conversation. This paper will overview selected major developments that have occurred in places that have been bell weathers for charting such things and for illustrating likely obstacles to progress in religion and education: Europe and the United Kingdom, Canada, the United States, Japan, and China. Perhaps predictably, certain issues related to science have triggered continued heated debate including evolution, climate change, and ethics related to lifespan.

There are a number of contexts to note, each having their particular characteristics that both constrain wider generalization, yet offer insights that may, with care and tailoring, be applied elsewhere. These include historical relationships of church and state and popular sentiment to name just two. In all settings there are controversies involving what students should know, why they should know it, and how and where it should be taught. These questions translate into concerns over location of religion in the curriculum, textbook content, school board policies and community politics, and teacher and administrator competence in the subject matter and law. Within each international setting, there are issues and initiatives within public and private educational institutions at the Preschool through high school (or equivalent) levels as well as higher education. Additionally there is work done by religious institutions through churches, mosques, synagogues, and temples. There are also non-government organizations at work. These various venues and actors make for a rich and complex array of activity. This paper will address major developments in selected settings and venues. The argument will be made, and examples given, that significant resources have been developed and initiatives undertaken to advance the understanding of the place of religion in education. Among the remaining things to be achieved, however, are longitudinal data on project implementation and outcomes, the development of more and better strategies and materials for handling the controversies; and the development and implementation of preparation programs for educational staff in public settings.



Michael D. Waggoner is Professor of Education at the University of Northern Iowa where he has chaired the Graduate Program in Postsecondary Education since 1989. For thirteen years he also served as Chair of the Department of Educational Leadership, Counseling, and Postsecondary Education. His scholarly interests are in the academic study of religion and spirituality in education. He is in his 11th year serving as Editor of *Religion & Education*, an international, peer-reviewed journal (www.tandfonline/urel), and is also Book Series Editor for Routledge Research in Religion and Education. Dr. Waggoner was recently elected to Chair the American Educational Research Association's Religion & Education Special Interest Group (2012-14). His most recent book was published in 2011 by Routledge: *Sacred and Secular Tensions in Higher Education: Connecting Parallel Universities*.

Establishing Religion through Textbooks: The Paradox of Religion Teaching (Teaching about Religions) in Japan

Satoko Fujiwara

University of Tokyo

The idea of the separation of church and state shaping the current (post-WW2) Japanese Constitution was modeled after that of the United States. As for school education, there is no religious education in public schools except for partial religion teaching in social studies subjects while religious private schools are permitted to give confessional RE classes. Some activists in the religious sector have been opposed to the total secularization of public education, fearing that it should lead to moral decay among young Japanese. They have been lobbying the government to introduce *shūkyōteki jōsō kyōiku* (cultivation of religious sentiments) to public schools. *Shūkyōteki jōsō* is most commonly described as “feeling of awe for some being(s) beyond human knowledge” or “feeling of awe for the source of life.” *Shūkyōteki jōsō kyōiku* can be described as a sort of cross-denominational (non-sectarian) religious education intermingled with moral education. Its opponents are concerned that the cultivation of awe for higher being(s) as a national enterprise may resurge the authoritarian State Shinto educational system.

The public debate on the relationships between education and religion in Japan has thus been centered upon how to deal with the legacy of State Shinto. In contrast, in this paper I will attempt to demonstrate that the actual relationships are far more complex. My first-hand materials will be school textbooks used in social studies classes. That is to say, I will argue that teaching about religions in social studies subjects, which is supposed to be neutral and objective, is in fact quite confessional. The textbooks promote a particular view of religion and hierarchize religions. This is not merely a matter of spreading prejudices and discriminations. Since, in Japan, school textbooks are required to be authorized by the Ministry of Education (Culture, Sports, Science and Technology), it can be said that they function to establish official religion(s) by prioritizing certain religion(s), which is a violation of the separation of church and state.

What is most important is that this so far unnoticed confessionalism does not simply derive from the ideology of State Shinto. Its underlying factors are not only political but also pedagogical, institutional, cultural, and so on. Even the political factor is mixed: the textbooks are strange patchworks of both liberal and conservative discourses. Moreover, neither textbook writers nor publishers are aware of the confessional aspect of their descriptions of religions, believing that they are neutral and secular. I will explain concretely why such paradox has occurred. In addition, having published a book on the issue in Japanese lately, I will be able to report on what kind of responses I have received.

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Fields of specialization:

- Theories of Religious Studies, Religion and Education
- Board of directors member of the Japanese Association for Religious Studies (2010-)
- Executive committee member of the International Association for the History of Religions (2010-)
- International advisor of British Journal of Religious Education (2006-)
- International editor of Teaching Theology and Religion (2006-)
- Editor of Journal of Religious Studies of the Japanese Association for Religious Studies (2002-2007)

Publications in English:

- Robert Jackson and Satoko Fujiwara eds., *Peace Education and Religious Plurality: International Perspectives*, London & NY: Routledge, 2008.
- Satoko Fujiwara, “On Qualifying Religious Literacy: Recent Debates on Higher Education and Religious Studies in Japan,” *Teaching Theology and Religion*, 13/3, 2010.
- Satoko Fujiwara, “Has Deconfessionalization Been Completed? Some Reflections upon Québec’s Ethics and Religious Culture (ERC) Program,” *Religion and Education*, 38/3, 2011.
- Satoko Fujiwara, “Japan” in *Religious Studies: A Global View*, ed. by Gregory D. Alles, London & NY: Routledge, 2008.

Recent Publication in Japanese:

- *Kyokasho no naka no Shukyo (Religions in Textbooks)*, Tokyo: Iwanami, 2011.
- *Sekai no Kyokasho de Yomu Shukyo (Interpreting Religions through Textbooks from the World)*, Tokyo: Chikuma, 2011.

Sustainability Science as a Multidisciplinary Science for Understanding Complex Interactions between Natural, Human, and Social Systems

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Global sustainability concerns long-term constraints on resources, including, among others, food, water, and energy. The challenge of sustainability is the reconciliation of society's development goals with the planet's environmental limits over the long term. Nature, humans, and society are all important aspects of sustainability. Sustainability science is aimed at understanding the fundamental characteristics of complex and dynamic interactions between natural, human, and social systems (Kates, Clark, Corell, Hall, Jaeger, Lowe, McCarthy, Schellnhuber, Bolin, Dickson, Faucheux, Gallopin, Grubler, Huntley, Jager, Jodha, Kasperson, Mabogunje, Matson, Mooney, Moore, O'Riordan, and Svedin, 2001; Komiyama and Takeuchi, 2006). Hence it is crucial to make effective use of knowledge on diverse aspects of sustainability, which requires a broad range of academic disciplines, including natural sciences, engineering, social sciences, and humanities (Yarime, Takeda, and Kajikawa, 2010).

In developing sustainability science as a new academic field, it is important to investigate what kinds of conceptualization can be possible or desirable. Some of the most prominent characteristics of interactions between natural, human, and social systems have been identified, including reciprocal effects and feedback loops, nonlinearity and thresholds, surprises, legacy effects and time lags, resilience, and heterogeneity (Liu, Dietz, Carpenter, Alberti, Folke, Moran, Pell, Deadman, Kratz, Lubchenco, Ostrom, Ouyang, Provencher, Redman, Schneider, and Taylor, 2007). While these characteristics certainly represent the complexity of coupled human and natural systems, the mechanisms that explain why these characteristics emerge through complex interactions have not yet been clearly elucidated.

An approach to analyzing the sustainability of a system is to understand it as a balance between efficiency and resilience (Goerner, Lietaer, and Ulanowicz, 2009). Efficiency is defined as the network's capacity to perform in a sufficiently organized and efficient manner as to maintain its integrity over time, whereas resilience is considered to be the network's reserve of flexible fall-back positions and diversity of actions for meeting the exigencies of disturbances and the novelty needed for on-going development. Diversity, which means the existence of different types of agents acting as nodes in the network, and connectivity, which means the number of pathways between agents, play a central role in efficiency and resilience. System's resilience will be enhanced by more diversity and more connections, while efficiency tends to increase through streamlining, usually reducing diversity and connectivity. Also, as systems are parts of hierarchies

where systems of higher levels are made up of subsystems from lower levels, renewal in components is an important factor of adaptation and evolution (Voinov and Farley, 2007). By sustaining certain systems beyond their renewal cycle, we might decrease the sustainability of larger, higher level systems.

Previous studies in the field of sustainability mainly concern geographically remote areas. In this research we discuss a detailed analysis of sustainability in cases where innovation based on scientific and technological knowledge plays a crucial role in the complex interactions between natural and social systems (Yarime, 2010). That understanding will be of critical importance in making a transition to sustainability.

References

- Goerner, Sally J., Bernard Lietaer, and Robert E. Ulanowicz (2009). "Quantifying Economic Sustainability: Implications for Free-Enterprise Theory, Policy and Practice." *Ecological Economics*, **69**, 76-81.
- Kates, Robert W., William C. Clark, Robert Corell, J. Michael Hall, Carlo C. Jaeger, Ian Lowe, James J. McCarthy, Hans Joachim Schellnhuber, Bert Bolin, Nancy M. Dickson, Sylvie Faucheux, Gilberto C. Gallopin, Arnulf Grubler, Brian Huntley, Jill Jager, Narpat S. Jodha, Roger E. Kasperson, Akin Mabogunje, Pamela Matson, Harold Mooney, Berrien III Moore, Timothy O'Riordan, and Uno Svedin (2001). "Sustainability Science." *Science*, **292** (5517), 641-642.
- Komiyama, Hiroshi and Kazuhiro Takeuchi (2006). "Sustainability Science: Building a New Discipline." *Sustainability Science*, **1** (1), 1-6.
- Liu, Jianguo, Thomas Dietz, Stephen R. Carpenter, Marina Alberti, Carl Folke, Emilio Moran, Alice N. Pell, Peter Deadman, Timothy Kratz, Jane Lubchenco, Elinor Ostrom, Zhiyun Ouyang, William Provencher, Charles L. Redman, Stephen H. Schneider, and William W. Taylor (2007). "Complexity of Coupled Human and Natural Systems." *Science*, **317** (14 September), 1513-1516.
- Voinov, Alexey and Joshua Farley (2007). "Reconciling Sustainability, Systems Theory and Discounting." *Ecological Economics*, **63**, 104-113.
- Yarime, Masaru (2010). "Sustainability Innovation as a Social Process of Knowledge Transformation." *Nanotechnology Perceptions*, **6** (3), 143-153.
- Yarime, Masaru, Yoshiyuki Takeda, and Yuya Kajikawa (2010). "Towards Institutional Analysis of Sustainability Science: A Quantitative Examination of the Patterns of Research Collaboration." *Sustainability Science*, **5** (1), 115-124.

Theories and strategies of developing cross-cultural sensitivity: Applying Experiences in Japan

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The importance of cross-cultural preparation to ensure intercultural effectiveness when living or working abroad is widely understood by educational institutions, as well as global companies. Globalization takes people all over the world; wherein successful relationships with neighbors and intercultural partners demand the ability to deal effectively and positively while pursuing their goals. Japan is no exception, as the number of companies recognizes the importance of linguistic competence, as well as intercultural effectiveness, to succeed in the world's marketplace and demands the employees' ability to deal in the international arena. Within this scenario, goals, strategies, and measurement of intercultural competency have been researched and developed over the past years.

Three basic abilities for intercultural competencies are the following; 1) ability to develop and maintain personal relationships, 2) ability to communicate effectively and adequately without bias, and 3) ability to obtain cooperation and compliance with others (Fantini, 2000). Also, good intercultural relations or competences are based on sound interpersonal relations. Constructs of intercultural competences are often described with a variety of traits with, at least five dimensions, and often viewed as a developmental process.

The attributes cited include empathy, respect, flexibility, interest, patience, curiosity, motivation, openness, sense of humor, willingness to suspend judgment, and tolerance of ambiguity among others. Five dimensions, such as awareness, knowledge, attitudes, skills, and proficiency in the host tongue or a main common language for communication, are essential. Moreover, several models that explain the developmental process signifying education and training are crucial for improving intercultural competency.

This research explores current ideas about the nature of intercultural competence of Japanese youth and the development of cultural sensitivity in an intensive intercultural program. The aim of the research is to connect intercultural communication theories to the practices in order for participants to develop global mindsets in a unique closed environment; namely limited space, time pressures, and different languages and behaviors with which to adjust were some of the challenges. This research gives one aspect of educational evaluation using the Intercultural Development Inventory (IDI) (Hammer, 1999; Hammer, Bennett & Wiseman, 2003; Hammer, 2007) to evaluate the participants' development of cross-cultural sensitivity, which is the fundamental mindset for the global education. The result of the IDI showed the participants' growth through intercultural interaction; in which the participants were guided to shift from absolute dualism (right or wrong is clearly marked) to contextual relativism (one evaluates any position by its appropriateness to a defined context) and went beyond. The participants had to be responsible for creating their own humanistic guidelines and making personal choices, which are believed to be the crucial attitudes in order to work successfully in global contexts.

Toward ICT-Supported Multidisciplinary Approach for Integrated Sustainability Assessment

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The need for integrated sustainability assessment has been widely discussed and is urgent due to increasingly complex environmental system problems. These problems have impacted ecosystems and human well-being which represent a threat to economic performance of countries and corporations. A comprehensive systems approach is essential for effective decision making with regard to global sustainability, since industrial, social, and ecological systems are closely linked. This presentation will present systems approaches to investigate the impacts on ecological and human systems of major shifts such as climate change and the associated policy and technology responses.

The European Forest Institute (EFI) developed Tool for Sustainability Impact Assessment (ToSIA) has been adapted in order to incorporate the potential evolution of pulp and paper mills into integrated forest biorefineries. The preliminary adapted model will be discussed to aid in analyzing and gaining insights about developing sustainable forest biofuel supply chains. ToSIA serves as a decision support tool, which can offer potential compromise solutions to satisfy the triple dimensions of sustainability, and thus a good basis for advancing the methodology of Life Cycle Sustainability Assessment (LCSA). Like LCSA, ToSIA results depend on reliable databases and a great deal of quality data and information to represent critical indicators and metrics from various stakeholders. The potential of information and communication technologies (ICT) (e.g. semantic webs and wikis) to support further development of ToSIA and LCSA will be explored. Ongoing projects as well as research plans related to evolution of forest based industrial ecosystems and sustainable bioeconomy will be highlighted.



Dr. Halog obtained his Doctor of Economic Sciences from the University of Karlsruhe (TH), Germany. He has held positions in Japan as a Research Fellow in the National Institute of Advanced Industrial Science and Technology (AIST), the United Nations University, and Canada as an NSERC Fellow. Dr. Halog has a variety of global experiences and has received academic training in natural sciences and engineering, economics, business, and policy development. His research transcends the traditional boundaries of natural and social sciences. He is currently developing quantitative and computational models and tools to assess forest-based biofuels' technologies and industrial ecosystems, which can provide exciting breakthroughs in research and educational innovation in sustainability science and engineering. Broadly, his interests are industrial ecology, life cycle assessment, coupled human and natural systems, and biomass energy and fuels production. He presently holds an appointment as an Assistant Professor at the University of Maine. He has been recently based in Finnish Forest Research Institute (METLA), Finland as an Organization for Economic Cooperation and Development (OECD) Research Fellow.

Facilitating JSPS U.S. Alumni Donations to the Japan Disaster Nursing Society to Aid in Providing Disaster Assistance

Blanca Rosa Kacouris, Dawn Doutrich

JSPS U.S. Alumni Association

The devastating **Tohoku-Pacific Ocean Earthquake and Tsunami** happened in Japan last March 11 (2011) and took place during the first JSPS Multidisciplinary Science Forum. JSPS Alumni members were overwhelmed, saddened, and wanted to help however we could. We were motivated to donate to aid the aid workers we knew would be dispatched to support the survivors. Three thousand, five hundred dollars were collected from the JSPS U.S. Alumni. At the same time a call came for donations to the Japan Society of Disaster Nursing who were ready to send help in the form of disaster prepared nurses with expertise in this area. Their stories are available at the website: <http://www.jsdn.gr.jp/english.html>

Responses to the JSPS US Alumni donation included: “I am Aiko Yamamoto, Professor of University of Hyogo, Japan. Thank you for your concern and support to the Great East Japan Earthquake. We truly appreciate support from your organization. Aiko from Japan with many thanks.”

“I am Satoru Yamada, Chair of Japan Society of Disaster Nursing. Attached are photos of our activity and you can find a report of our activity as follows.”...Best regards, Satoru Yamada, Dr. Eng. Professor, Faculty of Nursing, UNIVERSITY of KOCHI”

Poster will include reports from the nurses who were part of the Japan Society of Disaster Nursing advance party and those who followed.

Student Panels

(Chair: Dajin Peng and Stephen G. Covell)

A Comparative Study of Higher Education in China, Japan and the United States

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This paper studies the differences among the Chinese, Japanese and the US systems of higher education. Bai finds that while the Asian countries enjoy huge advantage over the US system in pre-college education, the American system began to catch up in the college level. At the postgraduate level, the US system clearly prevails over the Chinese and Japan systems. What explains the changes? Bai finds that the strength of the US colleges is a reflection of the US economic and social management systems, which are performance-oriented. While the Japanese and Chinese systems were strong in pre-college education since they both have a highly competitive college entrance examination system that put great pressure on Japanese and Chinese middle and high school and even Elementary school students. Once the Chinese and Japanese students enter the college, most of them lose their clear directions and therefore motivations to work hard. While the Chinese and Japanese universities also have the school credit hour systems, their systems are not truly performance-oriented. Unlike the American college students, Chinese and Japanese college students cannot graduate even after they have taken enough credit hours. Almost all of them still have to stay in school for the same years they are supposed to stay. The requirements for the graduate schools in China and Japan are even lower. As a result, the undergraduate schools in most Asian universities like those in China, South Korea, Hong Kong, Singapore are preparatory schools for American graduate schools since most of the best graduates of the Asian universities will go to the US to pursue advanced degrees. This paper provides an insightful explanation of the differences of the three major systems of higher education of Japan, China and the United States and studies how Asian and American can learn from each other by drawing strength from each system.

The Riemann Boundary Value Problem with Square Roots in Class h_0 When the Jumping Curve Is an Open Arc in the Complex Plane

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In my presentation, I will first discuss the Riemann boundary value problem with square roots in class h_0 when the jumping curve is an open arc in the complex plane. It is solved by reducing it to a classical Riemann boundary value problem so that its solutions are obtained in closed form. In certain cases, some auxiliary function $\omega(z)$ is introduced. With different choices of $\omega(z)$'s, some interesting examples are illustrated.

Next, it has been solved that the Riemann boundary value problem with radicals when the jumping curve is an open arc in the complex plane, whose general solution had been discussed. Moreover, the frondose example has been given, for which the similar auxiliary function $\omega(z)$ has been introduced and proper cut of the complex plane been analyzed. We have achieved the solutions in closed form, from which the rationality of the general solution being discussed would be seen.

Moreover, the examples in detail would be given as well as the solutions of numerical value.

From Tokyo to Beijing: A Comparative Study of the revaluation of Japanese Yen in the 1980s and Chinese Yuan in the 2010s

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The revaluation of the Japanese yen after the Plaza Agreement had major impact on the Japanese and global economy in the mid 1980s. From 1985 to 1988, Japanese yen rose 86 percent in value versus US dollar. For a while, Japan became the largest investor in the world, while still sustaining huge trade surplus over the United States. However, the loss of international competitiveness due to the sharp rise of production cost as a result of the revaluation of yen caused a major problem for Japan. Just a few years after the Plaza Agreement, the Japanese economy plunged into a stagnation that has lasted for more than two decades. Until now the Japanese economy has still been in the trap.

Today China is facing similar situation as Japan did in the 1980s. The United States is exerting great pressure on China to revalue the Chinese yuan. However, China has been slower in allowing Chinese yuan to rise in value. From 2005 to now, Chinese yuan just rose 23 percent in value. Now the United States is putting further pressure to China to revalue the yuan. What China should do? Recently, China has sped up slightly the revaluation of yuan. Should China revalue yuan dramatically to accommodate the demand of the United States? The comparison between the revaluation process of Japanese yen in the 1980s and Chinese yuan today is going to be very helpful to explore the possible consequences of the revaluation of the Chinese yuan and the options of China's yuan strategy. In general, it is also a very useful case study of the relationship between exchange rates and economic growth/exports.

Ms. Lingyue Huang is a graduate student at the Illinois Institute of Technology. She got her BA degree in Finance from Southwestern University of Finance and Economics.

Generating Questions and Sparking Debates: An Analysis of the Critics and Defenders of Eliade

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The interpretation of Mircea Eliade's work has become an insightful niche of its own in the study of religion. The various interpretations that have been produced highlight a fundamental dichotomy in the field that goes beyond the focus on Eliade's work. Russell T. McCutcheon, quoting Burton Mack, states that the scholarly divide can be summed up as "caretakers or critics of religion." This pithy statement also neatly summarizes the basic divide among interpreters of Eliade; they are either custodians of his work or opponents who doubt the merit of his methodology. In other words, the scholarship on Eliade serves in many ways as a microcosm of the larger debates within academia.

This paper will focus on a small selection of texts by critics and defenders of Eliade's work and propose that the crux of the divide on Eliade is whether or not the authors accept religion as *sui generis*. It will explore the debate over *sui generis* religion and how it manifests in the selected scholars' work. It will explore whether or not we can derive useful methods from Eliade's work for present research; this will include a brief analysis of his methods of morphology and creative hermeneutics. This paper will demonstrate that in the same way a scholar's judgment on the issue of religion as *sui generis* influences how they define 'religion' and how they approach their research; likewise, this decision also influences their interpretation of Eliade's role in the study of religion.

Reference:

McCutcheon, *Manufacturing Religion*, David Cave, *Mircea Eliade's Vision for a New Humanism* (New York: Oxford University Press, 1993), Bryan S. Rennie, *Reconstructing Eliade: Making Sense of Religion* (Albany: State University of New York Press, 1996), Jonathan Z. Smith, *Map Is Not Territory: Studies in the History of Religions* (Chicago: University of Chicago Press, 1993), Smith, *Imagining Religion: From Babylon to Jonestown*. (Chicago: University of Chicago Press, 1982), Smith, *To Take Place: Toward Theory in Ritual* (Chicago: University of Chicago Press, 1987).

Brief introduction: Ms. Walker completed a MA in Medieval Studies at Western Michigan University during which she did a thesis under Dr. Simon regarding Riccoldo da Montecroce's *Ad nationes orientales* (completed 2009). She is currently finishing an MA in Religion at the same institution. Her recent work has been on the theology of work as presented by Durand of Huesca in the *Liber antiheresis*. She currently teaches Religions of the World and Introductory Latin at WMU.

Self and Not-Self Explored Through Indra’s Net and Leibniz’s Monadology

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Indra’s net is a Buddhist image that is meant to convey interdependence/co-dependant arising. What is interesting about this image is that one could very well interpret the image to represent the existence of selves or even an ultimate self (the net itself) upon which all other ‘selves’ are dependant. The two-fold interpretation that applies to the image of Indra’s net also applies to Leibniz’s monadology. In fact, Leibniz’s monadology is strikingly similar to the image of Indra’s net. Leibniz’s system, in contrast to Indra’s net, is meant to demonstrate the coexistence of all identities/selves. The picture put forward by Leibniz, however, can also be interpreted in two ways. I will argue that both Indra’s net and Leibniz’s monadology provide reasons for both interconnectedness and atomistic selfhood. I will explore the similarities, comment on the differences, and ultimately demonstrate that these two systems are complimentary, both identifying core issues surrounding reasons to endorse the existence of selves or not-selves.

Sean Butler (M.A. philosophy from San Diego State University, B.A. philosophy from Michigan State University) is a graduate student in Comparative Religion at Western Michigan University and an APPA certified philosophical counselor. His philosophical interests lie in Metaphysics, Early Modern Philosophy, and Philosophy of Religion. His interests in the academic study of religion are in Hinduism, Buddhism, Jainism, and Daoism.

Using geographically-weighted variables for mapping forest types in Ibaraki Prefecture, Japan

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Accurate and frequently-updated forest type maps are important for ecological and climate studies. Typically, spectral information from satellite imagery is used for classifying pixels in an image into different forest types. Training pixels for each forest class are collected from the image, and all other pixels in the image are assigned to the most spectrally-similar class. However, the spectral signature of a forest class may vary spatially due to local differences in rainfall, soil conditions, etc., so it may be more useful to consider nearer training sample pixels more heavily than farther training samples. In this study, we use geographically-weighted variables, which assign greater weighting to nearby training samples, in addition to raw spectral information for mapping Sugi planted forest, Hinoki planted forest, and natural broadleaf forest in Ibaraki Prefecture, Japan. Use of geographically-weighted variables resulted in an increase in overall accuracy from 82.2% to 85.9%. These results indicate that using geographically-weighted variables have the potential to increase the accuracy of land cover maps in forested areas.

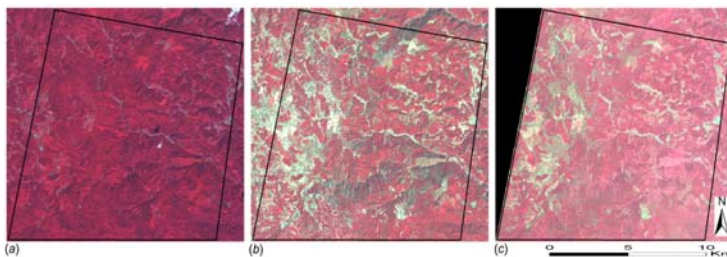


Figure 1: ASTER color infrared imagery from September 2010 (a), March 2011 (b), May 2011 (c). Healthy vegetation appears red. The study area boundary is shown as black line.

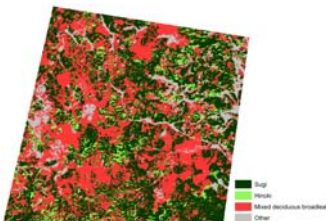


Figure 2: Classified forest type map (85.9% accurate)



Brief introduction: I am a Ph.D. student at Florida Atlantic University, and my research deals with (a) mapping land cover using satellite and aerial imagery, and (b) using Geographic Information Systems (GIS) datasets for environmental studies.

Process- and Ecologically-based Life Cycle Assessment of Palm Oil Biodiesel

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Within the framework of Life Cycle Sustainability Assessment of biodiesel derived from palm oil (*Elaeis guineensis*), its ecological impacts have been assessed using two different but complementary life cycle assessment (LCA) methods: The attributional LCA based on ISO14040 based and the ecologically-based LCA (Eco-LCA) based on the methodology recently developed at Ohio State University. The attributional LCA is a cradle-to-grave study seeking to investigate the environmental impacts of palm oil biodiesel life cycle from land preparation for oil palm plantation to biodiesel utilization in passenger cars. The results show that palm oil biodiesel has significant life cycle impacts in global warming and eco-toxicity potentials. The conversion of forest land and methane emission from anaerobic digestion of palm oil mill effluent and energy use in various processes are the most significant processes contributing to global warming potential. The use of herbicides and pesticides in plantation that emits glyphosate and cyphermeterin to the air and agricultural soil significantly contribute to ecotoxicity potential. An Eco-LCA study was performed in order to extend the comprehensiveness of the sustainability assessment taking into account goods and services from ecosystem. The aggregation of ecological inputs were classified based on mass, energy and industrial cumulative exergy (I exergy). The results show the reliance of palm oil biodiesel to the natural capital provided by the ecosystem, including solar energy, carbon dioxide from atmosphere, detrital matter from biosphere, water from hydrosphere, as well as fossil fuels and various form of mineral from lithosphere which are not shown yet in the attributional ISO-LCA.

Environmental Life Cycle Assessment of Forest based Bioethanol Production with Biodiversity Impact Considerations

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In the conventional life cycle assessment (LCA) framework, biodiversity is one of the least considered impact categories. This impact category is very important when considering large scale biomass conversion to ethanol. Biodiversity impact assessment requires collection and analysis of spatial and non-spatial data. This can be accomplished using different system and geomatics analysis tools. We assess the biodiversity impacts from land use for forest based ethanol production by integrating spatial data and results from geographic information systems (GIS) and landscape management systems (LMS) into LCA framework.

In our work, LMS models different forest management and harvesting systems. GIS is used to model biodiversity impacts spatially with appropriate biodiversity impact indicators. LCA uses LMS and GIS outputs to calculate life cycle elementary flows and biodiversity impacts. We consider three different scenarios in blending ethanol with gasoline: E10, E25 and E85. Based on these scenarios, we analyze the level of impacts on biodiversity over time from 2010 to 2030. The biodiversity assessment of these ethanol production scenarios is based on the habitat information of focus vertebrate species. Different biodiversity impact indicators (e.g. species richness, evenness and habitat naturalness, etc.) are used to model the impacts. Our initial results show that biodiversity impact increases linearly as the level of ethanol blending is increased. However, the selection of biodiversity impact indicators also has a distinct role in determining the total biodiversity impact. This study will assist us in understanding the temporal and spatial performance of different bioproducts.

Japan Northeast Earthquake: thoughts on a personal experience as a volunteer in the affected areas

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I was traveling in Turkey when the earthquake happened in Japan, I knew about it from an e-mail from a friend in Egypt saying: “Are you alive? I hear there was a massive earthquake several hours ago...” he stated. I immediately checked the news and saw people being swapped away by tsunami. When I saw it, I was so shocked that I could not find any words to say. Suddenly, my family and friends came across my mind. I found myself calling them. Because I was far away from Japan, I could not do anything for the people affected by the earthquake although I wanted to. I simply wanted to support the people as I thought young energetic generation, like me, really needed to volunteer and support. Honestly, I could not believe what I was looking. All the houses were completely destroyed – there were just blocks of wood and furniture – so I could not ever recognize that there used to be houses right there. I thought this was a nightmare...It was impossible to admit that it was real.

I learned that there is no guarantee that tomorrow will come as so did today. We should live our lives with meaning and purpose. And try not to waste every single given moment. We should be thankful and appreciative of the resources we have. While I was working as a volunteer in the damaged area, I saw numerous foreigners who willingly came to support the people affected by the earthquake. I worked on removing rubble with an Australian. I saw several Sri Lankans voluntarily preparing curry to serve for the people... I also saw a number of foreign people volunteering in different ways. Additionally, I saw various substantial supports such as food, water, clothes, and medical care from the international community. The relief support experience taught me to achieve social responsibility in my own country and globally. Japan will take long years to recover and needs the support of each one of us.

Mr. Kazuto Matsuda is an undergraduate exchange student at the University of Iowa from Japan. He is currently studying International communication in addition to other various subjects such as culture and religion. Since graduation from high school, he has been very actively involved in numerous international programs and traveling all over the world. As in 2010, he participated in the 22nd Ship for the World Youth Program, an international youth exchange program organized and conducted by the Cabinet Office of Japan as a Japanese delegation member. After the program, he started to hold Japanese cultural exchange events in various countries such as Bahrain, United Arab Emirates, Oman, and Turkey cooperating with locals. He also worked for Japan International Cooperation Agency (JICA) in summer 2010 as a baseball technical staff in Ecuador and helped conducting the National Baseball Championship in Ecuador, the first national baseball tournament ever in the Ecuadorian history. In April 2011, one month after the massive earthquake that hit North Japan, he went to Miyagi prefecture, the place that was badly damaged by the earthquake and tsunami, and supported the people being affected as a volunteer.

Global Financial Crisis and Automobiles Industries in the United States, Japan and China

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The current Global Recession is considered to be the worst financial crisis since the Great Depression. Under the financial crisis, many industries were hard hit. In particular, throughout the world, the automobile manufacturing industries were deeply affected by the crisis. This paper studies how the global financial crisis has affected the automobile industries of the three largest economies in the world: the United States, Japan and China, which are also the three biggest producers of the automobiles in the world.

My research finds that major economic crises in history have often resulted in major changes in the automobile industries in the world. For instance, after the Great Depression of 1929-1933, three major automobile makes emerged as the dominant automobile giants in the United States. They made the United States the empire of automobiles in the world for many years. Also, as a result of the Stagflation following the oil crisis of 1979, Japanese automobile makers established their superiority in the global automobile market. A natural question for this global financial crisis is: what impact will this crisis have on the global automobile industries? Some may even go further and ask: Will China emerge as the next automobile superpower? I will try to address those important questions in my paper.

My preliminary research finds that the US auto industry was hit the hardest among the three countries. Because of substantial increase in the prices of fuels, sales of sport utility vehicles (SUVs) and pickup trucks, which are the big items for the US automakers, have decreased sharply. The car loan difficulties due to the credit crisis have made the sales problem even more serious. The US automobile industry is experiencing perhaps the greatest difficulty in history.

For similar reasons, Japan's automakers reported the same problems and their sales decreased sharply. At the end of 2008, Toyota declared that it expected the first time loss in 70 years of car making business. Honda decided to quit Formula one and is trying to sell the team. However, relative to the US automakers, the Japanese automakers are apparently in a much better position.

Even China, the rising star of the global economy and the fastest growing automobile industry, is also affected by the crisis. However, the level of difficulty is much lower. One major advantage for China is that China relies much less on credit (only 17 percent) than the USA (85 percent) on car purchases. As a new comer, Chinese

automobile industry is best poised to enter new fields such as fuel-efficient or even new-fuel models.

From my research, I find that although all the three economies have suffered from the crisis, the levels of difficulties and chances of restructuring success are very different. While the United States is hit most by the crisis, China is doing much better. If China can succeed in improving fuel-efficient models, it may pave the road for China to become the new superpower in the automobile industry. For the United States, it faces the challenge of either moving up to the more fuel-efficient models or going down and losing its position in the global automobile industries.

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A Comparative Study of Financial Services in China, Japan and the United Kingdom

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One lesson we can draw from the global financial crisis is that there is a greater need for international co-operation to strengthen the global financial system. In the short term it is important that each country has to undertake some corresponding measures to improve their public/business access to finance. However, in the long run, it is the successful integration between the developed countries like the UK and Japan and the emerging economies such as China that presents the greatest challenge to globalization.

For this purpose, this paper examines the financial services in three typical countries: UK, Japan and China from different perspectives, including: the history of creation, evolution, as well as the different characteristics of financial services in the three countries. UK stands for the most developed financial system which has a history of over 600 years and has London as the well-known banking centre of the World. Correspondingly, Japan has a highly developed financial service system that started the reform from the early 1970s. The Japanese government followed the European and American countries to implement the liberalization policies, to expand the domestic and international financial business. By 1981, only ten years later, it makes Japan's Sumitomo Bank and Dai-Ichi Kangyo Bank two of top ten banks in the world. This paper also studies what made Japanese banks stand out fast in the world financial market. Last but not least, China which is still in its process to reform the financial system, is looming large in financial power. Since the full opening of China's financial services industry in 2006, China is catching up rapidly in financial services. It is just a matter of time that China will surpass the UK and Japan and becomes a leading power of financial services in the world.

This paper will find the different patterns of the three countries in the development of financial services. It will explore means for the three countries to overcome their problems and enhance their financial services.

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