

Abstracts

Excited-State Lifetime of Quantum Dots by Flow Cytometry

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Abstract:

The potential use of the long excited-state lifetime of quantum dots (Qdots) in flow cytometry has not yet been investigated, despite of their important applications in discriminating spectral overlap among excitable species and background autofluorescence in the targeted cells. Unlike short lived organic dyes, Qdots have long lived, multiexponentially decaying life time. This lifetime difference allows us to achieve lifetime multiplexing between Qdots and organic dyes. We can also discriminate between bound and unbound proteins based on the same idea. For this potential to be realized, we are examining the multi-exponential decay kinetics of quantum dots in our current home-built flow cytometry systems using a frequency domain method. We optimize the concentration of streptavidin-coated Qdots to bind onto biotin-coated microspheres for achieving highest fluorescence intensity. We propose to do the square wave modulation of a laser at a single optimal frequency in the lower Megahertz range and achieve multiple harmonic frequencies within that primary frequency. We will extract the phase delay of the fluorescence emission with respect to the side scatter light at each harmonic to reveal the multiple lifetimes in a single event. We want to look if we can accurately resolve the lifetime of quantum dots in flow cytometer.

An Observation of a Body in the Formalism of Aristotle, Newton and Einstein

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Abstract:

We Study the state(s) and associated laws of motion of a body in the Aristotelian, Newtonian and Einsteinian Physics with reference to their equation(s) of motion in chronological order. The Mathematical formalism compatible with their Physical logics has been carried out using Euclidean geometry, Calculus, Tensors analysis and Riemannian geometry. Our Study found that inconsistencies found in prior conception and laws have been corrected by later theories and henceforth state(s) of a body has been attributed in more accurate fashion.

Key Words: *Aristotelian Physics, Newtonian Mechanics, Relativity*

Morphological Dependence in the Spatial Orientation of Nearby Local Super-cluster Galaxies

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Abstract:

We study the spatial orientation of 5169 galaxies that we have radial velocity 3000kms⁻¹ to 5000 kms⁻¹. The 'position angle inclination' method is used to find the spin vector and the projections of spin vector of the galaxy rotation axes. The spatial isotropic distribution is assumed to examine the non random effects. For this, we have performed chi-square, Fourier, and auto-correlation tests. We found a random alignment of spin vectors of total galaxies with respect to the equatorial coordinate system. The spin vector projections of total galaxies are found to be oriented tangentially with respect to the equatorial center. The spiral galaxies show a similar orientation as shown by the total sample. Five subsamples of barred spiral (late type) galaxies show a preferred alignment. However, early-type barred spirals show a random orientation. A weak morphological dependence is noticed in the subsamples of late type barred spirals. A comparison with the previous works and possible explanation of the results will be presented.

Key words: *Galaxies: evolution, Galaxies: formation, Galaxies: statistics. Galaxies: clusters.*

Design of a Governor and a Voltage Regulator for Laboratory Generator

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Abstract:

Customer driven microgrids are small distributed energy resources connected to distribution feeder that provides electricity to customer premises. The penetration of these modular resources provides benefits such as availability of power supply during disturbances, islanded operation and utilization of renewable resources. One of the important challenges of microgrid is voltage and frequency control during grid connected or islanded operation. Microgrids ought to operate stable under faults and various disturbances. To address these challenges many control schemes, incorporating voltage and frequency droop have been proposed. The purpose of this project is to describe the development of a governor and a voltage regulator for a synchronous generator in a laboratory-scale microgrid. A governor changes the turbine power or speed reference to control frequency. It is a proportional controller with speed droop. An Automatic Voltage Regulator automatically adjusts the generator field current to maintain a desired terminal voltage. The El Paso Electric Power Laboratory consists of test benches with motor-generator sets that can be interconnected through a transmission network to emulate a microgrid. The turbine or prime mover is simulated using a DC motor. A power electronics based governor is implemented using a DC-DC buck converter. The control system, implemented in a microcontroller includes the frequency droop and a current feedback that cancels the inherent droop of the motor. A similar hardware design is implemented for the voltage regulator. The future goal is to add a

synchronizing module so that frequency and voltage control can be added on to any distributed resource technology.

Short Circuit Analysis of Type II Induction Generator and Wind Farm

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Abstract:

With recent proliferation of wind farms over the world, it has become important to study the short circuit characteristics of different types of wind turbine generators (WTGs). This paper describes the short circuit characteristics of a Type-II WTG, and a wind farm comprised of this type of generators. A commercial time-domain software (PSCAD) is used to model the WTG and the wind farm. The induction machine model is validated against real field data, thus increasing the credibility of the results. The difference between the short circuit responses of Type-I and Type-II WTGs is described. Response of an actual wind farm with Type II WTGs to faults outside and inside the farm is also documented and analyzed.

Keywords: *Fault, induction machine, short circuit analysis, wind turbine generator*

Preliminary Work to Classify the Disturbance Events Recorded by Phasor Measurement Units

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Abstract:

With increasing use of phasor measurement units in power system, an enormous amount of data is being stored in phasor data concentrators (PDCs). PDCs have the capability to store disturbance files separately. Over a period of time, the number of such disturbance files keeps increasing. However, these files are not really mined for data and mapped to actual events that may have caused the disturbance. This paper uses actual disturbance files from a PDC in the Public Service Company of New Mexico (PNM) system that collects data from four PMUs, and shows how the data needs to be preprocessed before it can be used. It also evaluates the performance of a feature extraction and classifier tool on some limited data files that store data for known disturbances logged by PNM. Based on these initial results, effectiveness of the classifier tool is evaluated, and future work is proposed that may ultimately lead to real time identification of disturbance events immediately after the disturbance files are created.

Mechanisms Involved in the Response and Resistance of *Staphylococcus aureus* to Antiseptic Biocides

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Abstract:

Staphylococcus aureus is a major cause of both hospital- and community-acquired infections. The relatively high incidence of infections caused by multiply antibiotic-resistant methicillin-resistant *S. aureus* (MRSA) strains remains a major concern within the medical community. The majority of healthcare visits for suspected skin and soft tissue infections are caused by *S. aureus*, and MRSA can cause a high percentage of these infections. *S. aureus* and MRSA are susceptible to various antiseptic biocides and have been targeted in decolonization clinical trials. One such antiseptic biocide is tea tree oil (TTO), extracted from *Melaleuca alternifolia*, native to southeast Australia. It has been shown to exhibit broad-spectrum antimicrobial activity *in vitro* and is comprised of hundreds of hydrocarbon components, including the major antimicrobial terpene, terpinen-4-ol. Preliminary trials suggest that TTO formulations may be effective in the treatment of acne and fungal infections, and bacterial pathogen decolonization protocols. The bactericidal activity of TTO has been historically attributed to its ability to denature proteins and alter membrane and cell wall structure and function. In an effort to better understand the antistaphylococcal activity of TTO, transcriptional profiling was performed with *S. aureus* exposed to a growth inhibitory concentration of TTO. Additionally, TTO-reduced susceptibility (TTO^{RS}) mutants of *S. aureus* were isolated to examine how *S. aureus* might evolve to become less susceptible to common antiseptic biocides. The transcriptomic response of *S. aureus* to TTO exposure revealed the up-regulation of heat shock genes and down-regulation of genes involved in transcriptional and translational processes. A very similar response was observed previously in an ethanol stimulon of *S. aureus*. *S. aureus* TTO^{RS} mutants demonstrated reduced susceptibility to broadly utilized alcohols and cell wall- active antimicrobials while contrastingly expressing an increased susceptibility to triclosan. The mechanism of TTO^{RS} results from a subpopulation of *S. aureus* exhibiting a novel small colony variant phenotype. Overall, investigations have offered intimate insight into the response and acquisition of altered antimicrobial susceptibility in *S. aureus* following TTO exposure. Specifically, we have elucidated mechanisms by which *S. aureus* can respond and resist the static and cidal effects exerted by antiseptic biocides.

Assessment of Corrosion Potential of Coarse Backfill Aggregates for Mechanically Stabilized Earth Walls

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Abstract:

The service life of mechanically stabilized earth walls depends on the rate of corrosion of the metallic reinforcements used in their construction. Assessment of corrosion potential requires the accurate evaluation of pH, resistivity, and sulfate and chloride concentrations of aqueous solutions in contact with the surrounding aggregate. There is a tendency among highway agencies to utilize larger-size aggregates that contain only a small amount of fine material (passing No. 40 sieve) in the backfill. Evaluation of the electrochemical parameters of coarse aggregates is challenging because traditional methods utilize only fine material. We tested the effectiveness of traditional soil characterization techniques for use with coarse aggregates by performing leaching experiments with coarse limestone and dolomite aggregates from six quarries in Texas. Chemical differences were isolated from size-related kinetic leaching effects by comparing results from the same-sized material collected in the field versus material derived from the crushing of larger ($\geq 3/8''$) aggregates in the laboratory. Testing demonstrated that the

finer particles collected from the field were enriched in chemicals that when exposed to water decreased pH and resistivity and increased sulfate concentrations relative to the bulk rock. This is likely the result of sulfur compounds in the atmosphere reacting with carbonate rocks to produce reactive surface layers that are mechanically abraded into fines. This phenomenon can bias traditional soil testing results and therefore the assessment of corrosion potential. We demonstrate that a more accurate assessment of the electrochemical parameters can be obtained by crushing the coarse material to meet testing size specifications.

PRC1 Controls Spindle Polarization and Recruitment of Cytokinetic Factors during Monopolar Cytokinesis

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Abstract:

The central spindle is a post-anaphase array of microtubules that plays an essential role in organizing the signaling machinery for cytokinesis. The model by which the central spindle organizes the cytokinetic apparatus is premised on an antiparallel arrangement of microtubules, yet cells lacking spindle bipolarity are capable of generating a distal domain of ectopic furrowing when forced into mitotic exit. Because PRC1 and KIF4A are believed to play a principle role in organizing the antiparallel midzone array, we sought to clarify their roles in monopolar cytokinesis. While both factors localized to the distal ends of microtubules during monopolar cytokinesis, depletion of PRC1 and KIF4A displayed different phenotypes. Cells depleted of PRC1 failed to form a polarized microtubule array or ectopic furrows following mitotic exit, and recruitment of Aurora B kinase, MgcRacGAP and RhoA to the cortex was impaired. In contrast, KIF4A depletion impaired neither polarization nor ectopic furrowing, but did result in elongated spindles with a diffuse distribution of cytokinetic factors. Thus, even in the absence of spindle bipolarity, PRC1 appears to be essential for polarizing parallel microtubules and concentrating the factors responsible for contractile ring assembly, whereas KIF4A is required for limiting the length of anaphase microtubules.

Cross Property Connection between Thermal Conductivity and Fluid Permeability of the Porous Ceramics

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Abstract:

Cross property connection for the material relates the changes that appear in the physical property of the materials, which appears due to inhomogeneities (cracks, pores, inclusions) and more generally by microstructure. They are practically useful because some of the properties are easily measurable than others. Cross property connection has been discussed in literature about

half a century ago. The studies in the beginning showed the relationship between effective bulk modulus and electrical conductivity of the micro cracked conducting material. Further the relation between effective bulk modulus and thermal expansion coefficient was established. Here we try to relate the property which is controlled by the microstructural parameter with the concept of variational inequality for tortuosity of saturated rocks derived in terms of elastic properties. The cross property link between the fluid permeability through porous phase and electrical conductivity (heat conduction or ion conduction) through porous phase is established which might have application in the studies of material used in Fuel Cell. We have used the microstructural parameter tortuosity defined in literature to determine two different tortuosity, tortuosity for solid phase and tortuosity for porous phase. With the help of another microstructural parameter porosity cross property link between fluid permeability and electrical conductivity is established.

Spatial Variability of Hydraulic Conductivity and Sodium Content of Desert Soils: Implications or Management of Irrigation Using Treated Wastewater

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Abstract:

Information on soil hydraulic properties, their spatial variability and relation to soil chemical properties is crucial for making management decisions for lands affected by anthropogenic activities. *In situ* infiltration tests were conducted at West Mesa land application site to determine the spatial variability of hydraulic properties and to quantify the macroporosity using tension infiltrometer. Infiltration tests were conducted for an hour at 50 x 50 m sampling point and at -30, -20, -10, -5, and 0 cm pressure heads during March-April 2009. Wooding's equation was used to calculate near saturated (K_s) and unsaturated hydraulic conductivity; $K(\theta)$ from the steady state infiltration rate. Study area was divided into five classes of K_s from I to V. Coefficient of variation (CV) showed that different K_s classes were low to moderately variable and semivariogram displayed both short and long range variability. K_s kriged map showed classes I, II and III were concentrated at northeast and southwest side of the study site where higher Na^+ was detected and classes IV and V were at the center of the study site where lower Na^+ level was detected. Significant lower numbers of macropores and smaller macropore radius were observed in the area of lower K_s and higher Na^+ content. Therefore, further increase in Na^+ can further decrease the K_s and macroporosity and may affect the water uptake by the native vegetation. It is necessary to initiate the management practices changing the wastewater application pattern, higher wastewater in the lower Na^+ concentrated area and lower in the higher Na^+ concentrated area of the study plot.

Relationship between *apt* Mutation and Altered Cell Wall-Active Antimicrobial Susceptibility in *Staphylococcus aureus*

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Abstract:

Background: A previously identified purine salvage gene (*apt*) mutation occurred during vancomycin selection of vancomycin-intermediate *Staphylococcus aureus* (VISA) mutants. In an effort to understand an association of the *apt* mutation within the VISA mechanism, we report on the characterization of *S. aureus* 2-fluoroadenine (2-FA) reduced susceptibility (2-FA^{RS}) mutants harboring *apt* mutations. **Methods:** 2-FA^{RS} mutants were selected with *S. aureus* clinical MRSA heteroVISA strain MM66. Parent and mutants were subsequently analyzed by sequencing of *apt*, qRT-PCR, growth in the presence and absence of adenine, whole cell autolysis, and antimicrobial susceptibility tests (MICs, MBCs, gradient plates, population analyses). **Results:** Compared to MM66, 2-FA^{RS} *apt* mutants demonstrated increased resistance to adenine, but did not exhibit altered growth rates. MM66-2-FA^{RS} mutants also grew better in the presence of adenine and demonstrated reduced susceptibility to vancomycin and oxacillin, as well as reduced whole cell autolysis. qRT-PCR analysis revealed that the expression of purine metabolism genes *hpt*, *purA*, *purB*, *purDHM*, *purR* and *xpt*, vancomycin resistance-associated genes *vraSR* and *vraX*, and penicillin-binding protein genes *pbp1*, *pbp2* and *pbp3*, were all down-regulated in the 2-FA^{RS} mutants investigated. **Conclusions:** 2-FA selected *apt* mutants displayed improved growth in the presence of adenine and shared characteristics of the VISA phenotype; reduced susceptibility to vancomycin and a reduction in whole cell autolysis. Unlike other reports on the altered gene expression in VISA, purine biosynthesis genes and certain VISA responsive genes were actually down-regulated in the 2-FA^{RS} mutants. This study demonstrated that mutations altering purine metabolism affect vancomycin resistance levels in an hVISA.

Non-Catalytic Transesterification of Camelina Sativa Oil under Super Critical Ethanol Conditions with Hexane as Co-Solvent

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Abstract:

Non-catalytic transesterification of camelina sativa oil under supercritical ethanol (SCE) conditions with hexane as a co-solvent was investigated to study the fatty acid ethyl ester (FAEE) yields. This process enables simultaneous transesterification of triglycerides and ethyl esterification of fatty acids in a shorter reaction of time and may reduce the energy consumption due to simplified separation and purification steps. It was found that the co-solvent plays a vital role in reducing the severity of critical operational parameters and maximizes the biodiesel yield. The important variables affecting the ethyl ester yield during the transesterification reaction are the molar ratio of alcohol/oil, reaction time, reaction temperature and co-solvent to oil ratio. Camelina biodiesel samples were analyzed using FT-IR, GC-MS and thermogravimetric analysis (TGA) methods. The fuel properties of camelina biodiesel produced were compared with those of the regular diesel and found to be conforming to the American Society for Testing and Materials (ASTM) standards.

Recurring Slope Lineae: Seasonal Flow on Warm Martian Slopes

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Introduction: Recurring Slope Lineae (RSL) are dark, narrow features which extend downslope on steep (>20°), equator-facing, mid-latitude rocky slopes of Mars [1]. They are observed to form and grow during multiple warm seasons, and fade in cold seasons. Prior to this investigation, RSL had been confirmed from repeat coverage at only 7 locations ranging in latitude from 48S to 32S. Likely RSL (evidence of fading in cold seasons, but not yet observed to recur in multiple Mars years) were observed at 12 locations in the mid-latitudes. Candidate mid-latitude RSL (CMR), which have morphology and geological setting of RSL, but with no repeat imaging or without apparent changes were investigated in 12 locations. Candidate equatorial RSL (CER) (much like CMR but changes

Candidate	1	2	3	4	5	6	7	8	9	10	11	12
Likely RSL	1	1	1	1	1	1	1	1	1	1	1	1
CMR	1	1	1	1	1	1	1	1	1	1	1	1
CER	1	1	1	1	1	1	1	1	1	1	1	1
RSL	1	1	1	1	1	1	1	1	1	1	1	1

Figure 1. Description of different RSL candidates and numbers observed.

between images are observed and seasonality is unclear) were investigated at 8 locations in the equatorial region (Figure 1). Intensive monitoring of confirmed RSL sites was conducted in the most recent southern-hemisphere late spring to early fall, and we attempted to confirm additional candidates. We present results from our preliminary search for RSL over all latitudes of Mars in images acquired during 2011 by the High Resolution Imaging Science Experiment (HiRISE)[2] onboard the Mars Reconnaissance Orbiter (MRO). Summaries of updated thermal data, geographical distribution, slope

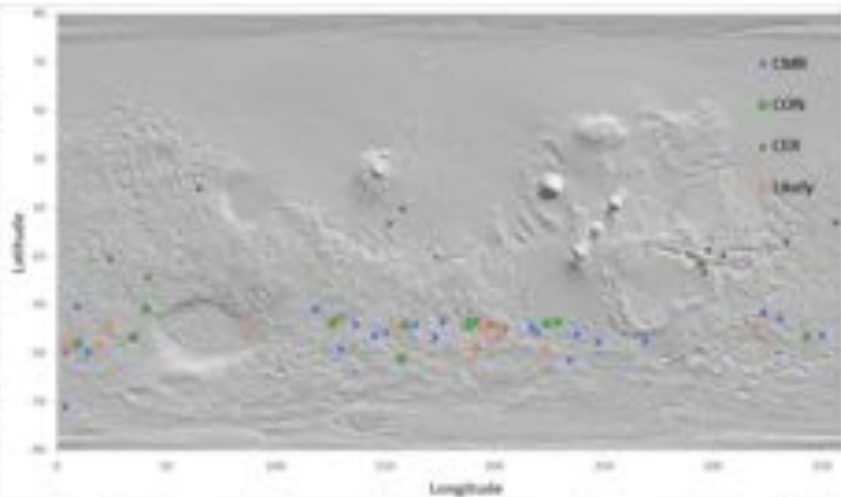


Figure 2. Geographical distribution of confirmed, CMR, CER and likely RSL.

profile and other attributes (albedo, elevation, thermal inertia etc) are also presented.

Statistics on image analysis and geographical distribution: HiRISE acquired ~2000 images over all latitudes during 2011 between Mars L. (areocentric longitude of the sun) 250-10. Out of those, 1818 images showed no signs of anything resembling RSL. Likely RSL were identified at 11 locations in the mid latitudes. CMR were observed at 22 locations, and CER at 7 locations (Figure 2). Candidate RSL (CMR and CER) could not be verified for various reasons including but not limited to: lack of repeat imaging, ambiguous identification of the features, limited resolution of an image, etc.

107 images corresponding to 15 sites showed confirmed cases of RSL. Most of these images were monitoring series of previously known RSL or RSL candidate sites. Incremental growth of RSL and fading were observed in the confirmed RSL images and recurrence was verified.

Geological Setting: RSL occur on slopes that appear geologically very recent, and are often found in "fresh" (very well-preserved) impact craters. Confirmed RSL sites are mostly mid-latitude craters with a low dust cover index (emissivity ranging from 0.96 to 0.98), thermal inertia of 98-411 Jm⁻²s⁻¹K⁻¹, albedo 0.105 to 0.285 and elevation -5049 to 2459 m. A list of attributes observed for RSL is presented in Table 1. The values for thermal inertia, dust index and albedo

represent a median around the center lat and lon of HiRISE images where RSL are observed, and therefore have some uncertainty because the RSL may not occur in the center of the image. RSL

have concave topographic profiles; the starting slope is always steeper than the ending slope. The average starting slope derived from five

HiRISE Digital Terrain Models (DTMs) of confirmed RSL sites is $\sim 33^\circ$, and the ending slope has a mean of $\sim 29^\circ$.

RSL mostly form on equator-facing slopes. Pole-facing slopes receive less radiance from the sun, which might explain why RSL are less abundant there. RSL on east-facing slopes are observed less often than west-facing slopes, which may be due to an observational bias as HiRISE acquires images at approximately 3:30 PM local time, casting shadows from the west. RSL sometimes occur on slopes covered by many small channels. The shape, size and the distribution of RSL at some of these locations remains almost unchanged (Figure 3), between multiple years. This could be because their flow is being controlled by small (few meters wide) channels that are not resolved by HiRISE, or the source of RSL between multiple years is the same.

The geologic settings of all confirmed RSL have some features in common: a bedrock exposure, steep rocky slope (mostly equator facing), and bright fans. The arrows in Figure 4 point to these features. The bright fans over which RSL flow may be a product of deposition caused by RSL over multiple years, perhaps salt-rich deposits.

Attributes	RSL
YES albedo[3]	(0.105-0.285)
Dust index[4]	(0.95-0.98)
Thermal inertia[5]	98-411
Width	Up to 5 m
Slope aspect preferences	Mostly equator facing, but S, E and W facing observed too
Latitudes; Longitudes	Confirmed RSL: 30-60 S.
Formation L_s	L_s 240-20
Fading timescale	Months
Associated with rocks	Yes
Associated with channels	Yes
Abundance on a slope	Up to thousands
Regional mineralogy	Variable
Formation events	Incremental growth of each feature
Yearly recurrence	Yes

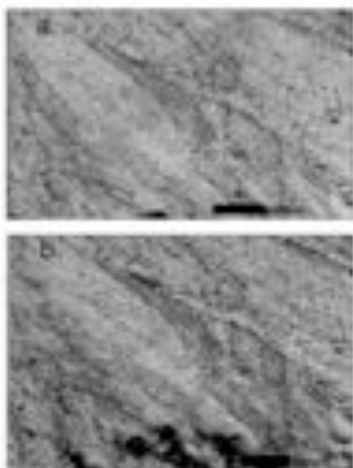


Figure 3. (a). HiRISE observation ESP_0014011_1315, (L_s : 308.34, acquired 07/23/2009) showing RSL on a NW facing slope in Raga Crater. (b). ESP_022437_1315, (L_s : 290.119, 05/10/2011) showing RSL on the same location. Downhill is to the upper left.

Possible Formation Mechanisms: Table 1 lists properties of RSL. The strong seasonal, latitudinal, and slope aspect distribution suggests that RSL require relatively warm temperatures. Maximum brightness temperatures derived from Thermal Emission Imaging System (THEMIS) brightness temperature (BTR) images of confirmed RSL locations (L_s 250-360) lie in the range of 250-300K [1]. However, temperature alone cannot explain the formation of these features. From our investigation, we observed more than 200 locations in the mid-northern to mid-southern latitudes that presented setting favorable to RSL (i.e., steep slopes, equator facing slopes, bedrock exposure, relatively fresh, boulders on the slope, etc.), but without signs of RSL. Equatorial regions get just as warm as mid-southern equator facing slopes but there are no confirmed case of RSL (Elorza crater has the best candidates, but further monitoring is needed). Volatiles on the surface or sub-surface, possibly brines, might be playing a crucial role on the formation of RSL.

Future Work: HiRISE successfully monitored many RSL sites this southern summer which helped us determine which candidate RSL are in fact confirmed RSL. New DTMs of RSL and non-RSL sites are necessary to understand if there is an obvious difference in slopes between them. Orthorectification of THEMIS BTR images to high resolution HiRISE DTMs is also necessary to decrease the uncertainty in the estimates of temperature under which RSL form. Although Compact Reconnaissance Imaging Spectrometer for Mars CRISM cannot resolve individual flows because of its resolution (18m/pix), it may resolve the bright fans or show changes over time. Laboratory spectral experiments will help us understand the kind of spectral signature shown by a dry vs a wet briny surface which may also help us understand why even at places densely covered by RSL, CRISM hasn't detected any liquid water[6].

References: [1]McEwen et al. (2011) Science. [2]McEwen et al. (2007) J. Geophys. Res. [3]Christensen et al. (2001) J. Geophys. Res. [4]Ruff, S.W., and P.R. Christensen (2002) J. Geophys. Res. [5] Putzig, N. E., Mellon, M. T. (2007) Icarus. [6]Masse et al (this conference).

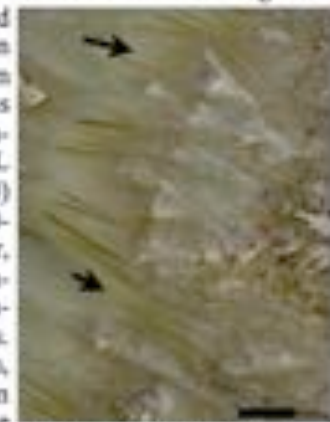


Figure 4. ESP_022659_1300 (enhanced RGB) (L_s : 302) showing RSL emanating from bedrock exposures on a steep rocky slope over bright smooth fans. Arrows pointing to bright smooth fans.

Reproductive Cancers in Women: High Burden but Low Priority in Nepal

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Abstract:

Reproductive cancers such as ovarian, uterine, cervical, vulvar, vaginal and breast cancers are common problems of Nepalese women. Cervical cancer is the most common cancer in women followed by breast cancer. While screening and early detection methods are available for cervical and breast cancer, yet lack of government policy, national cancer control plan and lack of proper resources has affected prevention of these cancers. Most of the women afflicted by reproductive cancers come to health care facility with advanced stage of the disease where management of disease and extension of survival years is very difficult. Screening test for cervical cancer is well established and cost effective; however, it is still inaccessible to thousands of Nepalese women. Similarly, a preventive vaccine for cervical cancer is available but it is not affordable to all eligible girls. Mammography, which can detect early breast tumors and cancers are neither affordable for poor women nor widely available in hospitals. Data on other cancers of female reproductive organ such as ovarian, uterine, vulvar and vaginal cancer are lacking. Additionally, many women do not have sufficient knowledge on etiology, causation and prevention strategies for these reproductive cancers. Most hospitals do not have reporting system for these cancers, which further worsen the estimation of current situation of these cancers in women. For a country where burden of these cancers in women is high, prioritizing resources, finances, and screening facility is essential. A review and analysis of current situation of reproductive cancers will be the primary focus of this presentation. A discussion will be made on ways to prevent these epidemic cancers and ways to strengthen capacity, allocate resources, and community involvement to fight breast and gynecologic cancers in Nepal.

Keywords: *Reproductive Cancer, Breast Cancer, Cervical Cancer, Screening, Nepal*

Broken Foundation: Urgent Need for Improvement

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Abstract:

This paper aims to explain how primary educational status of government school students is inaccessible to many children of the country despite their cheap or no fee structure. While the modern education system in Nepal has the history of more than one and half centuries, educational opportunities were limited within Rana families until 1951. During the Rana regime, limited schools were established for Rana children, whereas the education of any kind to the commoners, let alone going to school, was strictly prohibited.

After the revolution of 1950, the nation established an education system with free primary education to all children, although it was not compulsory to all children. Despite the access of education to common people for more than 60 years since the fall of Rana regime, the 'disadvantaged' groups of national population are still deprived of the full benefit of the education system due to poor management, lack of quality, and relevance to this group. And, in some cases, the educational accesses to disadvantaged groups are still the challenges even for elementary level education. Such disparity in educational access and quality between rich and

poor, in many ways, stems from the lack of facilities and funding for government schools. Moreover, the inadequacies of facilities and funds in government-run schools coupled with scanty economic conditions have kept this group away from realizing even the no-fee elementary education. A further problem for government schools in Nepal is that they suffer from a high rate of absenteeism which is often linked to issues such as child labour and also, especially in girls, the need to stay home and care for younger siblings and helping parents in household tasks.

Much as the Nepal government provides text books for subjects as part of the national curriculum, exercise books and writing materials are not provided. Many disadvantaged families cannot afford to provide such basic materials as they barely have enough to provide sufficient food for their families, let alone provide educational equipment. The lack of sufficient educational material tends to be a disincentive for pupils to actively participate in education and results in failure to attend the school.

Currently, there are two distinctly different education systems in Nepal: private and government. Private schools are expectedly more expensive than the government schools, but the quality of education also differs between government and private schools. Although much more expensive, the private school tends to be better in education delivery. In the similar vein, Nepalese citizenry's access to education can be divided into three distinct groups: 1) readily accessible group who can send their children to expensive private schools, 2) moderately accessible group who are able to send their children in government school and supplement their children's education for school's inadequacy, and 3) economically deprived group who cannot afford to send their children to school due to scanty economic conditions even in government schools. This paper discusses the issues pertaining to this third category of people.

With the development of modern knowledge system and infrastructural advancement, the country's stigmatized caste system has converted to a class system. In this third category of deprived group, people from all caste groups fall because these categories came to exist on the basis of economic determinant. Though primary education in government school is tuition-free, there are many people in the country who cannot afford their children's stationery expenses. This kind of situation is found in all types of settlements in the country-urban, suburban, and rural. These children usually have broken foundation, economically and socially. Government statistic of 2006 shows that there are nearly 14% primary-school-age children not enrolled in school. Enrollment numbers in Class One is high, but a large number of children drop out of their school before completing the primary level. As I alluded to the topic before, the two major causes, poor economic foundation and the unavoidable child labor to run the household, are responsible for such drop outs.

It is possible to send those children to school who have broken foundation and deprived from the brighter future, at least through primary school. To give a stationery support to a primary school child, it costs 4-15 dollars depending on geographical location. If we, diaspora, seriously make a team in every location in the USA, and collect \$10 from each member; then we can bring a change. Out of approximately 60,000 Nepalese population of the US, if we are successful to secure the support of only 10%, we can generate \$60,000 per year. With that amount, we can support 10-12 thousand students who are deprived from primary education.

Keywords: *Primary education, disadvantaged group, access*

Extension Service and Farm Productivity in Nepalese Agriculture

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Abstract:

Agriculture extension service has been recognized as the complementary input for increasing farm productivity. Nepal has developed wide network of agriculture extension service. This study analyzes the impact extension service on farm productivity of Nepalese agriculture sector by using switching regression model. The data for the study is the panel data set obtained from Nepal Living Standard Survey I and II. The analysis shows that there is significant difference in the farm productivity between the farmers who receive and who do not receive the extension service. The major problem is the small number of farmers taking the service.

Keywords: *Agriculture, Productivity, Extension Service, Switching Regression*

Biotechnology, a Stairway for the Revitalization of Nepal

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Abstract:

Nepal, country of the tallest mountain in the world, 'Mount Everest', and birthplace of The Light of Asia, 'Gautam Buddha', occupies 0.1% of earth's total land mass and is landlocked between China and India. Nepal is home to multiple cultures, geographically distinct regions, varied climatic zones, and tremendous biodiversity. In the midst of such treasures, Nepal has an uncertain future due to political instability, corruption, and lack of modern technology, advancements, resources, and funds. Historically, Nepal has focused its efforts in research limited to agriculture, biodiversity, and health sector. Despite these efforts, Nepal has been unsuccessful in adopting new technologies such as those found in biotechnology. Biotechnology is an applied science concerned with the use of modified organisms and bioprocesses in the fields of engineering, technology, and medicine with applications ranging from commercial bio-products to novel therapeutic options. Instillment of biotechnology into Nepal's economic scene will be a vital component in the process of revitalizing Nepal's infrastructure. In particular, areas focusing on optimizing food stuffs to fight widespread malnutrition are being sought after through the use of genetically modified crops and livestock. Additionally, the diverse plants and fungi (e.g. Yarsagumba, *Ophiocordyceps sinensis*) indigenous to Nepal (many of which are uncharacterized) are valuable medicinal resources, which can be exploited, mass-produced, refined, and commercially marketed worldwide. Ventures that already exist include companies such as Everest Biotech (which produces novel goat polyclonal antibodies) and Intrepid Nepal (which provides clinical diagnostic tools and technologies). Although Nepal has realized the importance of modern biotechnology in the early 1980's, progress towards establishing functional biotechnology-based institutions and companies has been extremely difficult. In order to catalyze the formation of biotechnology incentives, recent Nepalese biotechnology organizations have been formed. The Biotechnology Society of Nepal (BSN) established in 2007, is the most active of such organizations working for biotechnology in Nepal. BSN is

committed to educate, create national and international collaborations, and organize public awareness events for the promotion of biotechnology in Nepal. BSN expedites its goals through endorsing and publishing the *Nepal Journal of Biotechnology*, E-bulletins, and E-Interviews on biotechnology experts. In hopes of pursuing novel avenues to create a sustainable biotechnology sector in Nepal, global networking and expertise are required to assimilate funds and resources that are adequate for the development of increased biotechnology projects in Nepal. Biotechnology has the potential to alleviate hunger, diminish poverty, and improve overall health conditions, all of which are focal points in the revitalization of Nepal.

Keywords: *Biotechnology, BSN, Nepal*

Rhetorical Construction of Indiginity and its Problem in Nepal

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Abstract:

There is no universally accepted definition of indiginity and it is loosely defined as ethnicity in Nepal as elsewhere. Historically speaking indiginity is related to the original inhabitants of a territory. It refers to the ethnic groups that have historical ties to groups that existed in a territory prior to colonization or formation of a nation state. In Nepal, some indigenous people fall into this category while some so-called "Indigenous People" define themselves as indigenous based on normative framework of self-determination that frames the structure of indigenous identity. At the foundation of this normative framework is the principle of self-determination, and specifically an understanding that only indigenous peoples themselves can define who is indigenous. This normative framework of self-determination can be further understood as a reciprocal arrangement that includes first a self-identification as an indigenous people, and secondly an acceptance/affirmation of that identification by the community. The principle of self-determination (self-identification) of indiginity that many "Indigenous People" adopt to identify them is a rhetorical construction that does not meet the prototypical definition, and thus a political construction in order to get political reservation in different strata of the state, which, has, in essence, messed up who are real indigenous people in Nepal. In this paper, I will engage in rhetorical analysis of the construction of indiginity, discuss the problems it has created in Nepal, and try to offer some solutions to these problems.

Diaspora Investment: Opportunities and Challenges in Transport

Infrastructure in Nepal

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Abstract:

Nepal has been experiencing unprecedented human mobility since late 1990s. According to the World Bank Survey (2009), a total of 2.1 million Nepalese migrant workers, here forth called Nepali diaspora, out of 29 million populations, are abroad. The rate of migration has been continuously increasing and consequently, remittance inflow is staggering. Nepal received remittance of 3.5 billion USD in 2010 which constitutes 20% of its total GDP. However, most of the remittance flow is limited to intra-family financial activities that basically support their family and relatives. Due to the absence of proper mechanism, financial flow from diaspora to

productive investment sector, especially infrastructure development, is not channelized effectively. On the other hand, Nepal has one of the lowest transport densities and effective network access levels which are vital to development and socio-economic transformation. Numerous transport infrastructure projects ranging from medium to large scale cannot be materialized due to lack of development fund. Government has limited internal resources and dependence on donor support is ever increasing. Therefore, fund for transport infrastructure has always remained a key issue. Recently government of Nepal has brought forward strategy of public private partnership (PPP) under various schemes namely, Build Operate Transfer (BOT), Service Contract (SC), Management Contract (MC), and Annuity Contract (AC), Special Project Vehicle (SPV) Contract, User Community or User Group or NGO based contract. Under current PPP approach, Nepali diaspora capital from various host countries can be mobilized in infrastructure development project with profitable rate of return. This will benefit all stakeholders—homeland, hostland and diaspora themselves.

Keywords: *Nepal, diasporas, investment, transport infrastructure, public private partnership*

Graduation and Beyond: A Tale of Four States and Four Universities

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Abstract:

The first priority of a graduate student is to complete a requirement of the program and graduate. While it is important to graduate, planning ahead for beyond graduation is paramount for enduring success. In this short presentation, I will talk about what a graduate student should do (1) to succeed in graduate school and (2) to succeed after graduation.

Federalism in Nepal: Issues and Challenges

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Abstract:

After the successful "April Movement" in 2006, people are discussing the way of forming new Nepal. In this context people are advocating for federalism as a new governance structure. But federalism is a new concept for Nepal. Academicians are suggesting different models of it. In this paper I discuss about why the ethnic federalism is not the way out for the future of Nepal.

Clumsy Solutions to a Wicked Problem of Climate Change: Case of Nepal

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Abstract:

The ability of society to respond to impending challenges of climate change is unlikely to follow a smooth trajectory with time. Getting ahead of the possible consequences of climate change is contingent upon abilities of households, communities, and their supporting institutions to respond to it. Ambiguity, mind-bending complexity, and irreducible uncertainty associated with

climate change make it a '*wicked problem*' that continue to frustrate the search for elegant and linear solutions for which society has had a long history and experience. The 'wickedness' of the problem urges us to go beyond coherent approach and adopt '*clumsy solution*' that are pragmatic and go outside the wisdom expert resolution to deploy an array of practical solutions that are location-specific and embedded in values and norms of communities in question. Given this approach, it is important to unravel how existing repository of knowledge might be used to manage complex and integrated crop and livestock systems in the foothills of the Himalayas help achieve climate-resilient systems that enable a smoother transition to uncertain future climate. Drawing upon case studies from Nepal, this paper demonstrates the value of clumsy solutions in light of adaptation to climate change. More specifically this paper demonstrates how smallholder agricultural system, which once was vulnerable, has evolved to become one of the most resilient systems to climate through complementarities achieved between local and expert driven knowledge.

Keywords: *clumsy solution, wicked problem, climate adaptation, smallholder farmers, Himalayas.*