

SPHERES

Specialized Philippine Enterprise Reference of Experts and Scientists

Volume 6 No. 2 December 2022

ABOUT THE SPECIALIZED PHILIPPINE ENTERPRISE REFERENCE OF EXPERTS AND SCIENTISTS (SPHERES)

The Division of Documentation of the National Institute of Science and Technology published the first volume of the Philippine Men of Science in 1964. It contained one hundred one bio-bibliographies of living men and women in the field of science and technology. It keeps track of our scientists and their contributions for the information and benefit of all. The compilation aims to provide interested users a useful and effective reference.

In 2012, the 24th volume of the Philippine Men of Science was uploaded online to make it more visible and accessible to users. Subsequently, the publication was renamed as the Philippine Men and Women of Science in 2013 to adopt a gender-sensitive title.

Today, the publication is given a new name – Specialized Philippine Enterprise Reference of Experts and Scientists (SPHERES).

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Each volume of SPHERES consists of two issues annually.

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**DR. AIMEE YVONNE CRISELLE LANDICHO AMAN***Omic Technologies*

Dr. Aman is an expert on Omic Technologies. She is one of the S&T Fellows at DOST-PCHRD. She was a Research Assistant Professor at the UP National Institutes of Health. Also, she previously worked as Senior Science Research Specialist and Program Manager of the Cardiovascular Genetics and the Diabetes Mellitus Study Groups on the Institute of Human Genetics-National Institutes of Health and the Philippine Genome Center

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Master of Science in Clinical Epidemiology, University of the Philippines Manila, 2014 - *present*

Doctor of Medicine, University of the Philippines Manila, 2012

Bachelor of Science in Biochemistry, University of the Philippines Manila, 2006

Field of Specialization:

Clinical Epidemiology

Internal Medicine

Omic Technologies for Health

Genetics

Researches:

Article title: BAG6 Variant rs805303 is Nominally Associated with ACEi-induced Cough Among Filipinos.

Authors: Paul Ferdinand M. Reganit, Jose B. Nevado, Jr., Eva Maria C. Cutiongco – de la Paz, Jezreel L. Taquiso, Aimee Yvonne Criselle L. Aman, Elmer Jasper B. Llanes, Jose Donato A. Magno, Deborah Ignacia D. Ona, Felix Eduardo R. Punzalan, Lourdes Ella G. Santos, Richard Henry P. Tiongco III, Jaime M. Aherrera, Lauro L. Abrahan IV, Charlene F. Agustin, Adrian John P. Bejarin, and Rody G. Sy

Publication title: Philippine Journal of Science 149(1): 35-41, 2020

Abstract:

Cough is a common side effect of angiotensin converting enzyme inhibitor (ACEi) therapy. The incidence of ACEi-induced cough has been shown to correlate with genetic variation among different populations. This study aimed to determine the association of candidate genetic polymorphisms with ACEi-induced cough among Filipinos. Two hundred twenty (220) participants on ACEi therapy pressure-lowering in an unmatched case-control study (82 cases with ACEi-induced cough and 138 controls). Genomic DNA samples were extracted and genotyped for selected genetic variants. The association of genetic variants and clinical factors

with ACEi-induced cough was determined using regression analyses. Univariate logistic regression showed that the BAG6 variant rs805303 is nominally associated with ACEi-induced cough among Filipinos, at a per-comparison error rate (PCER) of 0.05 (OR 2.10, $p = 0.016$). The association of the variant with ACEi cough was statistically significant after multiple regression analysis (adjusted OR 2.09, $p = 0.022$) while adjusting for confounding clinical factors (sex, alcohol intake, and diastolic blood pressure). Further studies are needed to validate these findings.

Full text link <https://tinyurl.com/33c7nxdu>

Article title: The Klotho Variant rs36217263 Is Associated With Poor Response to Cardioselective Beta-Blocker Therapy Among Filipinos.

Authors: Rody G. Sy, Jose B. Nevado Jr, Elmer Jasper B. Llanes, Jose Donato A. Magno, Deborah Ignacia D. Ona, Felix Eduardo R. Punzalan, Paul Ferdinand M. Reganit, Lourdes Ella G. Santos, Richard Henry P. Tiongco II, Jaime Alfonso M. Aherrera, Lauro L. Abrahan IV, Charlene F. Agustin, Aimee Yvonne Criselle L. Aman, Adrian John P. Bejarin, Eva Maria C. Cutiongco – de la Paz

Publication title: Clinical Pharmacology and Therapeutics 107(1):221-226, 2020

Abstract:

A common drug used for hypertension among Filipinos is beta-blockers. Variable responses to beta-blockers are observed, and genetic predisposition is suggested. This study investigated the association of genetic variants with poor response to beta-blockers among Filipinos. A total of 76 Filipino adult hypertensive participants on beta-blockers were enrolled in an unmatched case-control study. Genotyping was done using DNA from blood samples. Candidate variants were correlated with clinical data using χ^2 and logistic regression analysis. The deletion of at least one copy of allele A of rs36217263 near Klotho showed statistically significant association with poor response to beta-blockers (dominant; odds ratio (OR) = 3.89; $P = 0.017$), adjusted for diabetes and dyslipidemia. This association is observed among participants using cardioselective beta-blockers (crude OR = 5.60; $P = 0.008$) but not carvedilol (crude OR = 2.56; $P = 0.67$). The genetic variant rs36217263 is associated with poor response to cardioselective beta-blockers, which may become a potential marker to aid in the management of hypertension.

Full text is available upon request to the author

Article title: Variants Near CETP, MTP and BUD13-ZPR1-APOA5 may be Nominally Associated with Poor Statin Response Among Filipinos.

Authors: Lourdes Ella G. Santos, MD, Jose B. Nevado, Jr., MD, PhD, Eva Maria C. Cutiongco-de la Paz, MD, Lauro L. Abrahan IV, MD, Aimee Yvonne Criselle L. Aman, RCh, MD, Elmer Jasper B. Llanes, MD, Jose Donato A. Magno, MD, Deborah Ignacia D. Ona, MD, Felix Eduardo R. Punzalan, MD, MSc, Paul Ferdinand M. Reganit, MD, MPH, Richard Henry P. Tiongco II, MD, Jaime Alfonso M. Aherrera, MD, Charlene F. Agustin, MD, Adrian John P. Bejarin, MD and Rody G. Sy, MD

Publication title: Acta Medica Philippina 56(10):23-31, 2022

Abstract:

Objective. Several studies showed that genetic factors affect responsiveness to statins among different populations. This study investigated the associations of candidate genetic variants with poor response to statins among Filipinos.

Methods. In this unmatched case-control study, dyslipidemic participants were grouped into statin responders and poor responders based on the degree of reduction in LDL-c from baseline. DNA from blood samples were genotyped and analyzed. The association of candidate variants with statin response was determined using chi-square and logistic regression analysis.

Results. We included 162 adults on statins (30 poor responders as cases, 132 good responders as controls). The following variants are nominally associated with poor response to statin among Filipinos at a per-comparison error rate of 0.05: rs173539 near CETP (OR=3.05, p=0.015), rs1800591 in MTTP (OR=3.07, p=0.021), and rs1558861 near the BUD13-ZPR1-APOA5 region (OR=5.08, p=0.004).

Conclusion. Genetic variants near CETP, MTTP and the BUD13-ZPR1-APOA5 region are associated with poor response to statins among Filipinos. Further study is recommended to test the external validity of the study in the general Filipino population

Full text link <https://tinyurl.com/mpt79t6x>

Article title: A Genetic Polymorphism in GCKR may be Associated with Low High-Density Lipoprotein Cholesterol Phenotype among Filipinos: A Case-Control Study.

Authors: Rody G. Sy, MD, Jose B. Nevado, Jr., MD, Eddieson M. Gonzales, MD, Adrian John P. Bejarin, MD, Aimee Yvonne Criselle L. Aman, MD, Elmer Jasper B. Llanes, MD, Jose Donato A. Magno, MD, Deborah Ignacia D. Ona, MD, Felix Eduardo R. Punzalan, MD, Paul Ferdinand M. Reganit, MD, Lourdes Ella G. Santos, MD, Richard Henry P. Tiongco II, MD, Jaime Alfonso M. Aherrera, MD, Lauro L. Abrahan IV, MD, Charlene F. Agustin, MD and Eva Maria C. Cutiongco-de la Paz, MD

Publication title: Acta Medica Philippina 56(10):49-56, 2022

Abstract:

Background. Low levels of high-density lipoprotein cholesterol (HDL-c) is a well-recognized risk factor in the development of cardiovascular diseases. Associated gene variants for low HDL-c have already been demonstrated in various populations. Such associations have yet to be established among Filipinos who reportedly have a much higher prevalence of low HDL-c levels compared to other races.

Objective. To determine the association of selected genetic variants and clinical factors with low HDL-c phenotype in Filipinos.

Methods. An age- and sex-matched case-control study was conducted among adult Filipino participants with serum HDL-c concentration less than 35 mg/dL (n=61) and those with HDL-c levels of more than 40 mg/dL (n=116). Genotyping was done using DNA obtained from blood samples. Candidate variants were correlated with the low HDL-c phenotype using chi-squared test and conditional logistic regression analysis.

Results. Twelve single nucleotide polymorphisms (SNPs) were associated with low HDL-c phenotype among Filipinos with univariate regression analysis. The variant rs1260326 of glucokinase regulator (GCKR) (CT genotype: adjusted OR=5.17; p-value=0.007; TT genotype: adjusted OR=6.28; p-value=0.027) remained associated with low HDL-c phenotype, together with hypertension and elevated body mass index, after multiple regression analysis.

Conclusion. The variant rs1260326 near GCKR is associated with low HDL-c phenotype among Filipinos. Its role in the expression of low HDL-c phenotype should be further investigated prior to the development of possible clinical applications

Full text link <https://tinyurl.com/yck7m283>

Article title: Variant rs6596140 of Follistatin-like 4 Gene (FSTL4) May Be Associated with Poor Response to Angiotensin Receptor Blockers (ARBs) among Filipinos.

Authors: Deborah Ignacia D. Ona, Jose B. Nevado Jr., John Daniel A. Ramos, Elmer Jasper B. Llanes, Jose Donato A. Magno, Felix Eduardo R. Punzalan, Paul Ferdinand M. Reganit, Lourdes Ella G. Santos, Richard Henry P. Tiongco II, Jaime Alfonso M. Aherrera, Lauro L. Abrahan IV, Charlene F. Agustin, Aimee Yvonne Criselle L. Aman, Adrian John P. Bejarin, Eva Maria C. Cutiongco-de la Paz, and Rody G. Sy

Publication title: Philippine Journal of Science 150(4):703-721, 2021

Abstract:

Constituting one of the most commonly used antihypertensive drug families are the angiotensin receptor blockers (ARBs). The aim of this study was to identify the variants associated with response to ARBs that may potentially be used as markers for designing a tailor-fit treatment strategy for hypertension. An unmatched case-control study was done among adult hypertensive Filipino patients maintained on ARBs. Genotypic analysis of blood DNA was conducted. Logistic regression analyses were performed to determine association of clinical and genetic variables with ARB response. A total of 69 poor responders and 126 normal responders were included in the study. After performing univariate logistic regression, five single nucleotide polymorphisms showed association with poor response to ARBs. The genetic variant rs6596140 remained significant (dominant model; OR 2.36, p = 0.009) after adjusting for female sex and age. Variant rs6596140 was found to be associated with poor response to ARBs among Filipinos. Prior to clinical application, verification is recommended prior to clinical application. As the function of this variant is presently unknown, an investigation to elucidate its role in ARB response in hypertension is also recommended.

Full text link <https://tinyurl.com/4ttcueev>

Article title: rs17465637 variant of MIA3 may be associated with coronary artery disease among Filipinos.

Authors: Aimee Yvonne Criselle L. Aman, Rody G. Sy, Jose B. Nevado Jr., Adrian John P. Bejarin, Paul Ferdinand M. Reganit, Richard Henry P. Tiongco II, Elmer Jasper B. Llanes, Jose Donato A. Magno, Deborah Ignacia D. Ona, Felix Eduardo R. Punzalan, Lourdes Ella G. Santos,

Jaime Alfonso M. Aherrera, Lauro L. Abrahan IV, Charlene F. Agustin, and Eva Maria C. Cutiongco-de la Paz

Publication title: Philippine Journal of Science 150(5): 1051-62, 2021

Abstract:

Genetics is an important component in the development of coronary artery disease (CAD); however, studies on the Filipino population are lacking. This study aimed to determine the association of polymorphisms with the development of CAD among Filipinos. This is an age and sex-matched case-control association study involving 122 adult Filipinos with CAD and 230 control participants without CAD. DNA from blood samples were genotyped for candidate single-nucleotide polymorphisms (SNPs) using Illumina GoldenGate Genotyping (GGGT) assay. Candidate variants and clinical data were correlated with the occurrence of CAD using chi-square and logistic regression analysis. Of the candidate variants analyzed, only rs17465637 in MIA3 (adjusted OR 2.38; $p = 0.024$) was found to have a nominal association with the development of CAD among Filipinos after adjusting for hypertension, type 2 diabetes mellitus (T2DM), and smoking status. This finding may potentially allow earlier identification of Filipino patients at risk for CAD. Validation of these findings in a larger cohort is recommended.

Full text link <https://tinyurl.com/2vpduc78>

Article title: The rs1458038 variant near FGF5 is associated with poor response to calcium channel blockers among Filipinos,

Authors: Felix Eduardo R Punzalan, Eva Maria C Cutiongco-de la Paz, Jose Jr B Nevado, Jose Donato A Magno, Deborah Ignacia D Ona, Aimee Yvonne Criselle L Aman, Marc Denver A Tiongson, Elmer Jasper B Llanes, Paul Ferdinand M Reganit, Richard Henry P Tiongco 2nd, Lourdes Ella G Santos, Jaime Alfonso M Aherrera, Lauro L Abrahan 4th, Charlene F Agustin, Adrian John P Bejarin, Rody G Sy

Publication title: Medicine 101(5): e28703, 2022

Abstract:

Genetic variation is known to affect response to calcium channel blockers (CCBs) among different populations. This study aimed to determine the genetic variations associated with poor response to this class of antihypertensive drugs among Filipinos. One hundred eighty one hypertensive participants on CCBs therapy were included in an unmatched case-control study. Genomic deoxyribonucleic acid were extracted and genotyped for selected genetic variants. Regression analysis was used to determine the association of genetic and clinical variables with poor response to medication. The variant rs1458038 near fibroblast growth factor 5 gene showed significant association with poor blood pressure-lowering response based on additive effect (CT genotype: adjusted OR 3.41, $P = .001$; TT genotype: adjusted OR 6.72, $P < .001$). These findings suggest that blood pressure response to calcium channels blockers among Filipinos with hypertension is associated with gene variant rs1458038 near fibroblast growth factor 5 gene. Further studies are recommended to validate such relationship of the variant to the CCB response.

Full text link <https://tinyurl.com/4nkc8fzp>

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DR. FRANCIS N. BALETA

Environmental Sciences

Dr. Baleta is one of the S&T Fellows II at DOST-PCIEERD. He is recognized for his contribution in the fields of Fisheries and Aquatic Sciences in the Philippines. A recipient of various international and national awards and grants for his research on the utilization of seaweed extracts and other terrestrial plants as growth promotant and immunostimulants for commercially-important aquaculture commodities. He authored and co-authored numerous scientific papers in aquaculture, fisheries, aquatic biodiversity, water quality management, and product development and value addition of aquatic resources.

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Post-doctoral Research Fellow, University of Idaho, USA, 2017

Doctor of Philosophy in Fisheries (Aquaculture), University of the Philippines Visayas, 2012

Master of Science in Fisheries (Aquaculture) Pangasinan State University, 2007

Bachelor of Science in Fisheries (Aquaculture) Central Luzon State University, 2004

Field of Specialization

Fisheries (Aquaculture)

Environmental Sciences

Researches:

Article title: Dietary incorporation of Sweet Potato *Ipomoea batatas* shots improved growth performance and haematological profile of *Tilapia Oreochromis niloticus* in Hapa Nets.

Authors: Francies Nuestro Baleta, Patricia Magistrado-Candelaria, Diomerl Edward Bondad Baldo, Love Joy Pallaya-Baleta, Lander Cezat Plantado, Mylene Concina Navarro

Publication title: Aquatic Research 5(1): 1-10, 2022

Abstract:

This study was conducted to evaluate the potential of sweet potato *Ipomoea batatas* powder (IbSPP), hot-water extracts (IbSPHWE) and crude ethanolic extracts (IbSPCEE) as growth promoter and immunoenhancer for tilapia cultured in hapa nets. Fish were divided randomly into four Treatments: T1 (control group) was fed a practical diet (PD) while T2, T3 and T4 were fed PD + IbSP powder (P), PD + IbSP hot-water extract (HWE), PD + IbSP Crude Ethanol Extracts (CCE), respectively. The growth indices and haematological profile of cultured fish were recorded after four months of feeding experiment. The final weight, weight gain, specific growth rate, condition factor, FCR, PER, FER were significantly higher in fishes that received PD + IbSPHWE than those that received either PD, PD + IbSPCEE or PD+ IbSPP only. The same trend was observed with the RBC, Hb, HCT, WBC and the PLT and its indices. The study has demonstrated that incorporation of the hot-water extracts of *I. batatas* could improve the

growth performance and increase immunocompetence of *O. niloticus* as evidenced by improved haematological profile.

Full text link <https://doi.org/10.3153/AR22001>

Article title: Growth performance and economic viability of dietary inclusion of *Ipomoea batatas* L. shoot powder and extracts in the practical diets of *Oreochromis niloticus* L.. In: Egyptian

Authors: Love Joy Pallaya-Baleta, FrancisNuestro Baleta, Patricia Magistrado-Candelaria, Lander Cezar Plantado, Diomerl Edward Bondad Baldo, Mylene Concina Navarro, Jericho Lara Encinas

Publication title: The Egyptian Journal of Aquatic Research, 2021

Abstract:

The study aims to determine the growth performance and economic viability of the dietary supplementation of camote i.e., *Ipomoea batatas* L. powder and extracts in the diets of the Nile tilapia. The fish were reared in twelve 1 m³ hapa nets installed in a 500 m² pond. Four groups of fish were used in the experiment; the control group was fed with formulated practical diets (PD), and diets supplemented with either camote shoot powder (PD + CSP), hot-water extract (PD + CSHWE), and crude ethanol extract (PD + CSCEE). The feeding trial lasted 12 weeks. The weight gain (WG), feed conversion ratio (FCR), feed efficiency ratio (FER), protein efficiency ratio (PER), specific growth rate (SGR), and condition factor (CF) were studied. The economic viability was determined through the cost of production, gross profit, cost-and-return, and profitability analyses. The fish fed with PD + CSHWE exhibited improved growth performance as evidenced by an increase in WG, FER, PER, SGR, and CF, while showing low values of FCR. The economic analyses also revealed that PD + CSHWE was the most economically feasible diet based on the cost of production, gross profit, cost-and-return, and profitability analyses. The study had proven that the incorporation of CSHWE in practical diets could improve the growth performance and increase profitability if used for tilapia culture.

Full text link <https://doi.org/10.1016/j.ejar.2021.11.005>

Article title: Growth and Immune Response of *Pangasius hypophthalmus* Fed Diets Containing Seaweed Extracts as Immunostimulants.

Authors: Francis Nuestro Baleta and Jonathan Mallillin Bolaños

Publication title: Brazilian Archives of Biology and Technology 62:1-11, 2019

Abstract:

Growth and immune response of *Pangasius hypophthalmus* were evaluated after feeding the fish with diets containing hot-water extracts (HWE) of *Sargassum oligocystum* as immunostimulant at 100, 300, and 500 mg kg⁻¹ diet. Basal diet for *P. hypophthalmus* served as the control. The experimental diets were administered for 12 weeks. At the end of the feeding experiment, growth and haematological profile of fish were evaluated. Result showed that final weight, weight gain, daily growth rate and feed conversion ratio were significantly increased in

the fish that received 300 and 500 mg kg⁻¹ HWE of *S. oligocystum*. Evaluation of the haematological profile showed that white blood cells red blood cells, hemoglobin, hematocrit and platelet of *P. hypophthalmus* that received the HWE of *S. oligocystum* were significantly higher than the control group. Overall, our results indicate that the use of *S. oligocystum* HWE improves growth and haematological profile in *P. hypophthalmus*.

Full text link <https://doi.org/10.1590/1678-4324-2019180083>

Article title: Assessment of Tilapia Cage Framing Practices in Relation to the Occurrence of Fish Mortality Along the Fish Cage Belt in Magat Reservoir, Philippines.

Authors: Francis Nuestro Baleta, Jonathan Mallillin Bolaños, and William Catli Medrano

Publication title: Journal of Fisheries and Environment 43(2): 1-13, 2019

Abstract:

The present study was conducted in Magat Reservoir, Philippines, to determine the profile and practices of tilapia cage farmers in relation to the occurrence of fish mortality. Eight stations were established: Station 1 (Baligatan), Station 2 (Namnama), Station 3 (Halag 1), Station 4 (Halag 2), Station 5 (Halag 3), Station 6 (Taliktik), Station 7 (Dallaw) and Station 8 (Isla Berde). A total of 80 households were interviewed from December 2016 to May 2017. Results showed that most incidents of fish mortality in cages occurred during the summer season (March to June). Farmers perceived the primary causes of fish mortality in Magat Reservoir to include fluctuating temperature (91.25%), water quality (83.75%), pollution and predation by birds (each 76.25%), parasite infestation (56.25%) and diseases (50%). Reduced feeding, isolation of the infected fish and proper stocking are the major activities conducted by the fish farmers to prevent the occurrence of fish mortality at Magat Reservoir.

Full text link <https://tinyurl.com/5n8jha85>

Article title: Phytochemical screening and antimicrobial properties of *Sargassum oligocystum* and *Sargassum crassifolium* Extracts.

Authors: Francis N. Baleta, Jonathan M. Bolaños, Oliva C. Ruma, Amaro N. Baleta, and Jayson D. Cairel

Publication title: Journal of Medicinal Plants Studies 5(1): 382-387, 2017

Abstract:

The present study was conducted to investigate the phytochemical contents and evaluate the antimicrobial property of *Sargassum oligocystum* and *Sargassum crassifolium* extracts collected from the coast at Diora-Zinungan, Santa Ana, Cagayan, Philippines. Extracts of powdered seaweed were prepared using sequential extraction with different organic solvents in order to increasing the polarity (Ethanol, n-hexane, dichloromethane and ethyl acetate and aqueous). Five fractions (Ethanol, n-hexane, dichloromethane ethyl acetate and aqueous) were examined for antimicrobial activity by using disc diffusion assay on thirteen (13) strains of aquaculture pathogen. The extracts showed the presence of phytochemical constituents like flavonoids, tannins, phenolics, sterols and terpenoids and the absence of saponins. Among the tested extracts for antimicrobial activity, ethanolic extracts was determined to be the best solvent for

isolation of antimicrobial compounds from the tested seaweeds followed by n-hexane, dichloromethane ethyl acetate and aqueous. The extract of the *S. oligocystum* and *S. crassifolium* showed presence of different groups of secondary metabolites such as flavonoids, tannins, phenolics, sterols and terpenoids which are important indicators of the microbial properties of seaweeds.

Full text is available upon request to the author

Article title: Design, fabrication and operation of fishing gears used along the coastal areas of Isabela, Philippines.

Authors: Francis Nuestro Baleta, Jaymark Guilalao Beltijar and Jonathan Mallillin Bolaños

Publication title: International Journal of Fisheries and Aquatic Studies 5(2):319-323, 2017

Abstract:

The study was conducted to document the design, fabrication and operation of fishing gears used along the coastal areas of Dinapigue, Palanan, Divilacan and Maconacon, Isabela, Philippines. There were thirty-three (33) different fishing gears identified and documented along the four studied stations. The fishing gears documented include; eighteen (18) lines, eight (8) nets, five (5) hand instruments, two (2) barriers and traps, one (1) aggregating device and one (1) accessory fishing device. Hook and line, multiple hooks and line and troll line are the most commonly used fishing gears by the fisher folks along the four study area. The most expensive fishing lines were kitang (set bottom long line) and the cheapest fishing gears were the bakulkol (hook and line) in terms of fabrication. Fisherfolks from the coastal towns of Dinapigue and Palanan uses payaw (fish aggregating device) to increase catch of tuna using multiple hooks and line

Full text link <https://tinyurl.com/mr26vpaj>

Article title: Croton oil Croton tiglium fruit water extracts as piscicides under simulated farm condition

Authors: Melrose Miguel Guerrero, Francis Nuestro Baleta and Jonathan Mallillin Bolaños

Publication title: International Journal of Fauna and Biological Studies 4(1): 81-85, 2017

Abstract:

The study evaluated the potential of *C. tiglium* fruit water extracts (0.5, 1, 2, 4, 8 and 15 ml 1-1) as piscicides for *G. affinis*, *O. niloticus* and *C. gariepinus* under simulated farm condition. Based on the 24, 48 and 72 h of exposure to all concentrations, the *G. affinis*, *O. niloticus* and *C. gariepinus* showed no significant differences on mortality except *C. gariepinus* at 0.5 ml 1-1. However, based on the 96 h of exposure to all concentrations 100 per cent mortality of *G. affinis*, *O. niloticus* and *C. gariepinus* was observed and showed no significant differences. The *G. affinis* and *O. niloticus* were the most susceptible fishes among the test organisms. The toxicity tests showed that *C. tiglium* has the potential to be used as piscicides, which can be an alternate to an expensive and scarcely available imported rotenone for eradication of undesirable fish species present in fish ponds. Signs of agitated

behaviors, respiratory distress and abnormal nervous behaviors including eventual deaths were observed in exposed fish. Control fish neither died nor exhibited any unusual clinical signs.

Full text link <https://tinyurl.com/2d2b96xz>

Article title: Influence of seasonal variation on the utilization and catch composition of fishing gears in Palanan, Isabela seashore, Philippines.

Authors: Hezron Gonzales Padios, Francis Nuestro Baleta and Jonathan Mallillin Bolaños

Publication title: International Journal of Fisheries and Aquatic Studies 5(1): 314-318, 2017

Abstract:

The study determined and documented the influence of seasonal variation on the utilization and catch composition of fishing gears along the coastal area of Palanan, Isabela. Ocular inspection of fishing gears and personal interviews were conducted at the stations namely: Dicotcotan San Isidro, Sabang Maligaya, Culasi, and Dimolid. Results showed a diversity of fishing gears and fish species documented along the study area at two seasons. The most commonly used fishing gears during the onset of summer and rainy seasons are: troll line, bottom set gill net, troll with bait fish (lonoy), bottom hook and line (pasayad), multiple hook and line (ug-og), multiple hook troll line (saliw-siw tuna), and spear. On the other hand, the most documented fish species caught by fishing gears are skipjack tuna, frigate tuna, scads, indo pacific sail fish, sardines and flying fish in summer and surgeon fish, siganids, and snapper for the rainy season.

Full text is available upon request to the author

Article title: Acceptability of selected herbs as off-odor remover and flavor enhancer for dried parrot fish *Scarus rivulatus*.

Authors: Reyamar Oliva Gonzales, Francis Nuestro Baleta, Jonathan Mallillin Bolaños

Publication title: International Journal of Food Science and Nutrition 2(2): 31-37, 2017

Abstract:

Acceptability of calamansi leaves, guava leaves and lemon grass aqueous extracts as off-odor and off-flavor remover and flavor enhancer to dried Parrot fish *Scarus rivulatus* were evaluated in terms of color, aroma, taste and texture and general acceptability. Students (high school and college) professionals (professors and researcher) pupils and cook served as panelists for the sensory and organoleptic evaluation. Dried parrot fish treated with guava leaf extract is the most preferred and highly acceptable by the panelists. Analysis of the sensory and organoleptic evaluation also show that dried parrot fish treated with either guava leaf, lemon grass and calamansi leaf extract is highly acceptable based on the different criteria of evaluation. Similarly, the guava leaf extract also masked the off-odor of dried Parrot fish. Proximate composition analysis of dried parrot fish treated with herbs revealed 80.2% crude protein, 0.065% crude fiber, 037% crude fat, 19.83% moisture and 10.15% ash.

Full text link <https://tinyurl.com/pd5cac9u>

Article title: Sensory, organoleptic, and proximate composition of smoked surgeon fish *Acanthurus* sp. using selected herbs as flavor enhancer.

Authors: Ariel Miguel Opeña, Francis Nuestro Baleta, Jonathan Mallillin Bolaños

Publication title: International Journal of Food Science and Nutrition 2(1): 174-181, 2017

Abstract:

The study evaluated the sensory, organoleptic and proximate composition of smoked Surgeon fish *Acanthurus* sp. using the extracts of either calamansi leaves, lemon grass or guava leaves. Effectiveness of these herbs as off-odor and off-flavor remover and flavor enhancer were evaluated in terms of color, aroma, taste, texture and general acceptability. Panelists include ten (10) members each from the group of cook, pupils, students (high school and college) and professionals (professors and researcher). Results of the study revealed that smoked Surgeon fish treated with guava leaf extract is the most preferred and highly acceptable by the panelists. Analysis of the sensory and organoleptic evaluation also shows that smoked Surgeon fish treated with either guava leaf, lemongrass, calamansi leaf extracts is highly acceptable based on the different criteria of evaluation. Similarly, the guava leaf extract also masked the off-odor of smoked Surgeon fish. The smoked surgeon fish treated with guava leaf extract were also subject to carcass analysis. Proximate composition revealed that smoked Surgeon contains 54.77% crude protein, 0.58% crude fiber, 11.38% crude fat, 29.55% moisture and 13.07% ash

Full text link <https://tinyurl.com/h7r5e2dt>

Article title: Antimicrobial Properties of *Sargassum* spp. (Phaeophyceae) against Selected Aquaculture pathogens.

Authors: Jonathan Mallillin Bolaños, Francis Nuestro Baleta and Jayson Domingo Cairel

Publication title: International Journal of Current Microbiology and Applied Sciences 6(2): 1024-1037, 2017

Abstract:

The purpose of this study was to investigate the antibacterial and anti-fungal activities of four species *Sargassum* namely: *Sargassum polycystum*, *Sargassum oligocystum*, *Sargassum crassifolium* and *Sargassum cristaeifolium* collected along the coastal areas of Diora-Zinungan Sta. Ana Cagayan, Philippines. Extracts of powdered seaweeds were prepared using sequential extraction with different organic solvents in order to increasing the polarity (Ethanol, n-hexane, dichloromethane and ethyl acetate and aqueous). Five fractions (Ethanol, n-hexane, dichloromethane ethyl acetate and aqueous) were examined for antimicrobial activity by using disc diffusion assay on thirteen (13) strains of aquaculture pathogens. The n-hexane, dichloromethane, ethyl acetate extracts displayed different antimicrobial activity against different aquaculture pathogenic bacteria and fungi whereas ethanolic extracts showed higher antimicrobial activity than aqueous extracts. The

extracts of *Sargassum* sp. showed a significant antimicrobial activity against Gram-positive and Gram-negative as well as the fungus. Among the tested brown seaweeds, *Sargassum polycystum* exhibited the better antimicrobial activity that has potentially used as antimicrobial agent and as natural immunostimulant with aquaculture industry for the treatment of microbial diseases and improvement of the health status of commercially important aquaculture species.

Full text link <https://tinyurl.com/5n7rw4bk>

Article title: Species Composition of Marine Food Fishes at Palanan, Isabela as Influenced by Seasonal Variation.

Authors: Amaro Nuestro Baleta Jr and Francis Nuestro Baleta

Publication title: International Journal of Fisheries and Aquatic Studies 4(3): 254-260, 2016

Abstract:

The present study was conducted to document the species composition of marine food fishes caught along the coastal waters of Palanan, Isabela at the onset of summer and rainy seasons. Ocular visits and personal interviews were conducted along the four landing sites at Palanan, Isabela namely; Dicotcotan, Sabang, Culasi and Dimolid. A total of seventy four (74) fish species belonging to 37 families and 9 orders were documented during the study periods. The families with the highest number of species identified were Acanthuridae and Carangidae with both eight species documented. *Acanthurus lineatus* (Blue-lined Surgeonfish) and *Atule mate* (Yellow-tailed Scad) were the most predominant species along the family Acanthuridae and Carangidae, respectively for both summer and rainy seasons. However, pelagic fish that belongs to the family Carangidae, Scombridae, Coryphaenidae, Synodontidae, Sphyraenidae, and Istiophoridae were very rare during rainy season. There were 19 species distributed to 8 families which are considered as by-catch and low-valued fish along the 4 landing sites of Palanan, Isabela.

Full text link <https://tinyurl.com/2jlvxtkj>

Article title: Phytoplankton Identification and Water Quality Monitoring Along the Fish Cage Belt at Magat Reservoir, Philippines.

Authors: Francis Nuestro Baleta and Jonathan Mallillin Bolaños

Publication title: International Journal of Fisheries and Aquatic Studies 4(3): 254-260, 2016

Abstract:

The present study was conducted to identify phytoplankton and characterize the physico-chemical parameters of waters from the fish cage belt at Magat Dam Reservoir, Philippines. Five stations were established along the fish cage belt at Magat Reservoir, namely: Station 1 (Magat Aqua Park), Station 2 (Namnama), Station 3 (Halag 1), Station 4 (Halag 3) and Station 5 (Baligatan). Water samples were collected twice weekly for three months. Water parameters that were monitored includes: temperature, transparency, dissolved oxygen, pH, ammonia and phosphate. Among the water parameters monitored, temperature, transparency,

dissolved oxygen, pH, ammonia and phosphate were within the acceptable range for fish culture. Thirty (30) species of phytoplankton were identified belonging to four classes. Division Chlorophyta (14 genera), was the most abundant followed by Bacillariophyta (10 genera), Cyanophyta (4 genera), and Euglenophyta (2 genera). The most dominant microalgae documented includes: *Pediastrum*, *Scenedesmus*, *Closterium*, *Merismopedodia* and *Nitzschia*.

Full text link <https://tinyurl.com/3z36ea2m>

Article title: Species Composition, Diversity and Abundance of Mangroves along the Estuarine area of Maligaya, Palanan, Isabela, Philippines.

Authors: Francis Nuestro Baleta and Ronald Santiago Casalamitao, Jr.

Publication title: International Journal of Fisheries and Aquatic Studies 4(2): 303-307, 2016

Abstract:

Present study was conducted to document the species composition, abundance and diversity of mangroves found along the river side of Maligaya, Palanan, Isabela. Seven stations were established along the study area using the line transect method. Species composition data revealed 14 species of mangroves identified from 6 families namely: Rhizophoraceae, Acanthaceae, Avicenniaceae, Sterculiaceae, Palmae and Melianaceae were present during the study period. The most abundant species across the seven stations are *Nypa fruticans*, *Bruguiera sexangula*, *Avicennia lanata* and *Xylocarpus granatum*. Highest diversity was recorded at 0.099 individuals per 500 m² for *Nypa fruticans*. Station 5 revealed the highest species richness and repetition index while Station 7 recorded the highest diversity as indicated by various indices of diversity. Results revealed that the mangrove forest of Maligaya, Palanan, Isabela has a diverse species of mangroves.

Full text link <https://tinyurl.com/mu6z28n8>

Article title: Some Notable Microalgae of the Principal Tributaries of Rio Grande de Cagayan, Philippines.

Authors: Francis Nuestro Baleta, Jonathan G Donato, Jonathan M Bolaños

Publication title: International Journal of Fauna and Biological Studies 3(3): 13-16, 2016

Abstract:

The study was conducted to identify and document the microalgae present in the principal tributaries of Rio Grande de Cagayan, and the Blue Lagoons of Palanan, Isabela. Water samples were collected by bucket from the identified sampling sites along the Siffu, Mallig, Ilagan and Magat rivers from July 2013 to January 2014. Thirty four (34) species of microalgae were identified belonging to four classes. Division Chlorophyta (17 genera), was the most abundant followed by Bacillariophyta (10 genera), Cyanophyta (4 genera), Euglenophyta (3 genera), and the most predominant genera of microalgae found along the major tributaries at Rio Grande de Cagayan and Palanan, Isabela, Philippines were the *Chorella*, *Kirchneriella*, *Scenedesmus* *Pediastrum* and *Oedogonium* (a chlorophyta), *Aulacosiera*, *Cymbella*, *Navicula*, *Nitzschia* and

Pinnularia (a bacillariophyta) Cyndrospermum and Oscillatoria (a cyanophyta) and Euglena (a euglenophyta).

Full text link <https://tinyurl.com/4b5f5694>

Article title: Species Composition, abundance, and diversity of seaweeds along the intertidal zone of Nangaramoan, San Vicente, Sta. Ana, Cagayan, Philippines.

Authors: Francis N. Baleta and Jayson P. Nalleb

Publication title: AACL Bioflux 9(2): 250-259, 2016

Abstract:

This study was conducted to determine the species composition, abundance and diversity of seaweeds found along the intertidal zone of Nangaramoan, San Vicente, Sta. Ana, Cagayan. The line transect method was used to identify and quantify the seaweeds abounding the three established stations divided into five quadrates. Representative specimens were also taken and seaweed-associated flora and fauna were documented. A total of 31 different species of seaweeds were identified in the study area belonging Rhodophyta (Galaxauraceae, Gelidiellaceae, Corallinaceae, Gracilariaceae, Solieriaceae, Lomentariaceae, Rhodomelaceae, Rhodymeniaceae), Phaeophyta (Dictyotaceae, Cystoseiraceae, Scytosiphonaceae, Sargassaceae) and Chlorophyta (Ulvaceae, Anadyomenaceae, Siphonocladaceae, Caulerpaceae, Halimedaceae, Dasycladaceae). The most abundant seaweed species across the three stations are: Turbinaria ornata, Mastophora rosea, Coelothix irregularis, Padina australis, Padina sanctae-crucis, Padina minor, Ulva clathrata, Ulva fasciata, Chaetomorpha crassa, Caulerpa racemosa and Halimeda opuntia. The seaweed species identified also have different densities ranging from 0.002 to 7.955 per m². P. sanctae-crucis had the highest density. With regards to frequency and relative frequency, C. irregularis, P. australis, P. sanctae-crucis, P. minor, T. ornata, U. fasciata, and C. crassa, appear in all 15 quadrates in Station 1, 2 and 3. Species richness, repetition index, Simpson's indices of diversity and its reciprocal were calculated to determine diversity of seaweeds along the study area. Station 3 obtained the highest species richness and repetition index. On the other hand, Station 2 recorded the highest diversity as indicated by the Simpson's index. When subjected to Simpson's index of diversity and Simpson's reciprocal index analyses, Station 2 also obtained the highest diversity. The intertidal zone of Nangaramoan San Vicente, Sta. Ana Cagayan has a diverse species of seaweeds as indicated by the results of abundance, distribution and diversity indices.

Full text link <https://tinyurl.com/4d0thawk>

Article title: Sargassum oligocystum as Immunostimulants: Effects on the Immune response and Disease Resistance of Nile Tilapia Oreochromis niloticus L

Authors: F. N. Baleta and M. J. Libatique

Publication title: Northern Philippines Journal 1(1): 25-34, 2015

Abstract:

No available

Full text available upon request to the author

Article title: Molluscicidal and Piscicidal activities of extracts of Castor Ricinus communis Bean for Aquaculture Management.

Authors: Francis Nuestro Baleta, Marites M. Ramos-Castro, May Anne S. Canceran

Publication title: The Israeli Journal of Aquaculture - Bamidgeh 67: 1177-1182, 2015

Abstract:

The study assessed the molluscicidal and piscicidal activities of castor plant *Ricinus communis* using its fruit (dried and fresh) against large and small golden apple Snails (GAS) and mosquito fish. We focused on the laboratory determination of lethal concentrations LC 50 and LC 100 through a static bioassay test. Separate experiments were performed for GAS and mosquito fish and ten experimental animals were stocked in each experimental unit. Based on a 24-hour lethal concentration (LC 100), the toxicity for large GAS was 96.21 ml/L for fresh fruits, 124.02 ml/L for dried beans. For small GAS, the toxic concentrations were 91.75 ml/L for dried beans, and 105.89 ml/L for fresh fruits. For the 24-h LC 50, the toxicity to large GAS of the two extracts were 47.05 ml/L for dried beans, and 39.28 ml/L for fresh fruits, and for small GAS they were 44.87 ml/L for dried beans, and 51.17 ml/L for fresh fruit. The lethal concentration LC 100 for mosquito fish (*Gambusia affinis* Baird and Gerard) was 2.08 ml/L for fresh extract and 1.71 ml/L for dried extract, while LC 50 on the 24-hour basis was 0.88 ml/L for fresh extract, and 0.35 ml/L for dried extract.

Full text link <https://tinyurl.com/mw9n4j8y>

Article title: Efficacy of *Sargassum oligocystum* Extract on the Innate Immunity of White Shrimp *Litopenaeus vannamei* and its resistance against *Vibrio alginolyticus*

Authors: Francis Nuestro Baleta, Yong-Chin Lin, Yu-Yuan Chen, Jiann-Chu Chen, Su-Tuen Yeh, Dedi Fazriansyah Putra and Chien-Lun Huang

Publication title: Journal of Fisheries Society of Taiwan 40(4): 241-256, 2013

Abstract:

This study was to examine immune response of white shrimp *Litopenaeus vannamei* and its resistance against *Vibrio alginolyticus* when shrimp received *Sargassum oligocystum* extract (SOE). Shrimp which had been immersed in seawater containing SOE at 300 and 500 mg/l for 4 h, hemocyte count and other immune parameters including phenoloxidase (PO) activity, respiratory burst (RB), superoxide dismutase (SOD) activity, glutathione peroxidase (GPx) activity, and lysozyme activity significantly compared to the control shrimp. The expressions of LGBP and PX, and mitotic index of hematopoietic tissue (HPT) of shrimp immersed in SOE at 100, 300 and 500 mg/l after 4 h were significantly higher than those of control shrimp. Shrimp immersed in 100, 300, and 500 mg/L SOE showed increased phagocytic activity and clearance efficiency to *V. alginolyticus*. Shrimp which had been immersed in seawater containing 100, 300 and 500 mg/l SOE after 4 h were challenged with *V. alginolyticus* at 4.5×10^6 colony-forming unit (cfu)/ shrimp, and then placed in seawater. The

survival rate of shrimp immersed in 300 and 500 mg/l SOE was significantly higher than that of control shrimp over 12~120 h. In conclusion, shrimp immersed in seawater containing SOE at 300 mg/l increase resistance, phagocytic activity and clearance efficiency against *V. alginolyticus* as an evidence of increases in hemocyte count, other immune parameters, expressions of LGBP and PX, and mitotic index of HPT

Full text link <https://tinyurl.com/2p9cesb3>

Article title: Biological Activity of the Extracts of *Sargassum oligocystum* against Aquaculture Pathogenic Bacteria.

Authors: Baleta, FN; Laureta, LV; Apines-Amar, MJS; Padilla, PIP; Quinitio, GF

Publication title: Israeli Journal of Aquaculture-Bamidgeh 63: 667-672, 2011

Abstract:

Sargassum oligocystum (Phaeophyceae) was collected from the coastal area of Sta. Ana, Cagayan, Philippines, and used in in vitro antibacterial assays against six pathogenic bacteria commonly occurring in aquaculture. The extracts (methanol, n-hexane, dichloromethane, ethyl acetate, aqueous) were screened against *Vibrio harveyi*, *V. parahaemolyticus*, *V. alginolyticus*, *Flavobacterium aurantiacum*, *Streptococcus faecalis*, and *Pseudomonas aeruginosa*. The methanol extract showed strong antibacterial activity against *V. harveyi*, *S. faecalis*, and *P. aeruginosa* and moderate activity against the rest of the test pathogens. In general, *V. harveyi* was the most susceptible strain to all the extracts. This study suggests that extracts of *S. oligocystum* may be promising sources of antibacterial agents for use in aquaculture.

Full text available upon request to the author

Article title: Sex Reversal of Nile Tilapia *Oreochromis niloticus* L. by Egg Immersion technique: The Effect of Hormone concentration and Immersion Time.

Authors: Arsenia G. Cagauan, Francis N. Baleta and Jose S. Abucay

Publication title: Proceedings from the Sixth International Symposium on Tilapia in Aquaculture, 2004

Abstract:

The study evaluated sex reversal of Nile tilapia *O. niloticus* by immersing the eggs in different concentrations of 17-methyl testosterone (0, 200, 400, 600, 800 $\mu\text{g l}^{-1}$) exposed for different times (24, 48, 72, 96 hrs). The main effects of hormone concentration (HC), immersion time (IT) and their interaction effect (HC \times IT) on hatching percentage, survival and percentages of male and female were determined. The main effects of HC and IT and their interaction significantly influenced hatching percentage, sex and survival of *O. niloticus* ($P < 0.001$). Hatching percentage decreased with increased IT. Similarly, survival of treated fry in net enclosures was affected by the increasing IT. Increased per cent male was observed with increasing HC and IT. The main effect of HC showed that the highest per cent male of about 84% was obtained at 800 $\mu\text{g l}^{-1}$, followed by about 79% at 600 $\mu\text{g l}^{-1}$, 75% at 400 $\mu\text{g l}^{-1}$, about 67% at 200 $\mu\text{g l}^{-1}$, and lowest in the control (59%) ($P < 0.05$). The main effect of IT that gave the highest per cent male of about

79% was at the longest duration of 96-hours. The interaction effect of HC x IT showed that the HC greater than 400 ug.l-1 appeared to be better in effecting higher percentages of males at longer ITs. Highest per cent male of 91% was attained at 800 ug l-1 HC at 96-hour IT comparable with the 88-89% in 400-600 $\mu\text{g l}^{-1}$ HC at the same IT. Hence, from this study the HC and IT of eggs that gave the highest per cent male was identified. The study has proven that it is possible to induce sex reversal of *O. niloticus* by egg immersion, an alternative technique from the traditional sex reversal method of feeding the fry with hormone-treated feeds.

Full text link <https://tinyurl.com/t8hpj2xj>

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**DR. JOYCE ANN T. DE GUZMAN***Optics and Photonics*

Dr. De Guzman specializes on Optics and Photonics. Currently, she is one of the S&T Fellows at DOST-PCIEERD. She received her PhD in Electrical and Electronics Engineering from the University of Manchester in United Kingdom. She previously conducted research studies involving characterization of defects responsible for light-and-thermally induced degradation in silicon solar cells.

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Doctor of Philosophy in Electrical and Electronic Engineering, The University of Manchester, United Kingdom, 2021

Master of Science in Applied Physics, University of Santo Tomas, 2011

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Semiconductors

Nanotechnology

Raman Spectroscopy

Photoluminescence Spectroscopy

Deep Level Transient Spectroscopy

Laplace DLTS

Minority Carrier Transient Spectroscopy

Economics

Public Policy

Medical Physics

Researches:

Article title: Passivation of thermally-induced defects with hydrogen in float-zone silicon

Authors: J A T De Guzman, V P Markevich, D Hiller, I D Hawkins, M P Halsall and A R Peaker

Publication title: Journal of Physics D: Applied Physics 54(27): 275105, 2021

Abstract:

In this study, passivation of thermally-activated recombination centers with hydrogen in n-type float zone (FZ) Si containing nitrogen has been investigated. Prior to hydrogenation samples were heated to 550 °C using rapid thermal annealing and conventional furnaces. A large decrease in minority carrier lifetime occurred upon the heat-treatments confirming previous

reports. A sequence of electron traps created in this process have been detected in the deep level transient spectra and characterized. Significant changes in the spectra have occurred after treatments in remote hydrogen plasma and subsequent annealing of the hydrogenated samples in the temperature range 100 °C–400 °C. A total elimination of electrical activity of the thermally induced defects has been observed in the hydrogenated samples subjected to annealing in the temperature range 150 °C–300 °C. The results obtained suggest a simple way for an effective cure of the degraded FZ-Si-based solar cells. Possible defect reactions occurring in the FZ-Si crystals and the role of nitrogen and carbon upon the performed treatments are discussed.

Full text link <https://tinyurl.com/btx53u9w>

Article title: Indium-Doped Silicon for Solar Cells – Light Induced Degradation and Deep Level Traps

Authors: Joyce Ann T. De Guzman, Vladimir P. Markevich, Ian D. Hawkins, Hussein M. Ayedh, José Coutinho, Jeff Binns, Robert Falster, Nikolay V. Abrosimov, Iain F. Crowe, Matthew P. Halsall, Anthony R. Peaker

Publication title: Physica Status Solidi A (PSSA), 2021

Abstract:

Indium-doped silicon is considered a possible p-type material for solar cells to avoid light-induced degradation (LID), which occurs in cells made from boron-doped Czochralski (Cz) silicon. Herein, the defect reactions associated with indium-related LID are examined and a deep donor is detected, which is attributed to a negative-U defect believed to be In₂O₂. In the presence of minority carriers or above bandgap light, the deep donor transforms to a shallow acceptor. An analogous transformation in boron-doped material is related to the B₂O₂ defect that is a precursor of the center responsible for BO LID. The electronic properties of In₂O₂ are determined and compared to those of the B₂O₂ defect. Structures of the B₂O₂ and In₂O₂ defects in different charges states are found using first-principles modeling. The results of the modeling can explain both the similarities and the differences between the B₂O₂ and In₂O₂ properties.

Full text link <https://tinyurl.com/2j9xjhem>

Article title: Electronic Properties and Structure of Boron-Hydrogen Complexes in Crystalline Silicon

Authors: Joyce Ann T. De Guzman, Vladimir P. Markevich, José Coutinho, Nikolay V. Abrosimov, Matthew P. Halsall, Anthony R. Peaker

Publication title: Solar RRL, 2100459, 2021

Abstract:

The subject of hydrogen-boron interactions in crystalline silicon is revisited with reference to light and elevated temperature-induced degradation (LeTID) in boron-doped solar silicon. Ab initio modeling of structure, binding energy, and electronic properties of complexes incorporating a substitutional boron and one or two hydrogen atoms is performed. From the calculations, it is confirmed that a BH pair is electrically inert. It is found that boron can bind

two H atoms. The resulting BH₂ complex is a donor with a transition level estimated at $E_c - 0.24$ eV. Experimentally, the electrically active defects in n-type Czochralski-grown Si crystals co-doped with phosphorus and boron, into which hydrogen is introduced by different methods, are investigated using junction capacitance techniques. In the deep-level transient spectroscopy (DLTS) spectra of hydrogenated Si:P + B crystals subjected to heat-treatments at 100 °C under reverse bias, an electron emission signal with an activation energy of ≈ 0.175 eV is detected. The trap is a donor with electronic properties close to those predicted for boron-dihydrogen. The donor character of BH₂ suggests that it can be a very efficient recombination center of minority carriers in B-doped p-type Si crystals. A sequence of boron-hydrogen reactions, which can be related to the LeTID effect in Si:B is proposed.

Full text link <https://doi.org/10.1002/solr.202100459>.

Article title: Acceptor-oxygen defects in silicon: the electronic properties of centers formed by boron, gallium, indium, and aluminum interactions with the oxygen dimer

Authors: Joyce Ann T. de Guzman, Vladimir P. Markevich, Ian D. Hawkins, José Coutinho, Hussein M. Ayedh, Jeff Binns, Nikolay V. Abrosimov, Stanislaw B. Lastovskii, Iain F. Crowe, Matthew P. Halsall, and Anthony R. Peaker

Publication title: Journal of Applied Physics (2021) JAP21-AR-DIS2022-05907R

Abstract:

It is well established that boron reacts with two oxygen atoms in Czochralski-grown silicon (Cz-Si) to form a defect, which is responsible for the dominant light-induced degradation (LID) in solar cells made from Cz-Si:B material. The detrimental effect of LID has stimulated a move by solar cell manufacturers to the use of silicon with other group-III dopants, particularly with gallium. Cz-Si:Ga is immune to the BO-type LID. The information available in the literature on the interactions of oxygen with either Al, Ga, or In impurities in Si is limited. We use ab initio modeling and junction spectroscopy techniques to study a family of defects with unusual electronic properties, which have been detected in Cz-Si samples doped with different shallow acceptor species. We have carried out detailed measurements of the temperature dependencies of hole emission rate, equilibrium occupancy, and hole capture kinetics for the traps observed in differently doped p-type Cz-Si samples. It is found from the analysis of the changes in magnitude of the deep-level-transient signals with temperature that the equilibrium occupancy function of the traps is characteristic for a defect with negative-U properties in all the samples. The positions of the $E(-/+)$ occupancy level of the defects are very close in differently doped samples, $E(-/+) = E_v + (0.31 \pm 0.01)$ eV. It is argued that the oxygen dimer interacts with group-III atoms in silicon and these interactions result in the formation of AsO₂ complexes (A is either B, Al, Ga, or In atom) with very similar electronic properties

Full text link <https://tinyurl.com/2czs6a4s>

Article title: Defect Reactions Responsible for Boron-Oxygen Degradation in Crystalline Silicon Photovoltaics

Authors: J.A.T. De Guzman, V.P. Markevich, A.R. Peaker, M. Vaquero-Contreras, J. Coutinho, I.F. Crowe, I. Hawkins, S. Hammersley, M.P. Halsall

Publication title: EUPVSEC Proceedings. (145-151), 3-936338-73-6, September 2020

Abstract:

Light-induced degradation of silicon solar cells containing boron and oxygen impurity atoms (BO-LID) has been linked recently with structural transformations of the defect consisting of a substitutional boron atom and two interstitial oxygen atoms - BsO₂. An atomistic model and configuration-coordinate diagram of the BsO₂ defect have been proposed (M. Vaquero-Contreras et al, J. Appl. Phys. 125 (2019) 185704). In the present work, we have studied the transformations of the BsO₂ defect between configurations with different recombination activity in n⁺-p-p⁺ diodes fabricated from Si:B+O materials with different boron concentrations using deep-level transient spectroscopy (DLTS) and Laplace DLTS. The transformations have been initiated either by minority carrier injection (MCI) by forward biasing the diodes (BO degradation) or by increasing the temperature of the diodes above 313 K in dark after the MCI treatments (BO annealing). The values of energy barriers for the forward and back processes have been determined and found to be consistent with those known from literature for BO-LID. Further, we have compared the defect reactions degrading the boron-oxygen system with similar reactions in material doped with gallium, indium or aluminium and discuss possible explanations of the reduced degradation in samples doped with group-III elements other than boron.

Full text available upon request to the author

Article title: Minority carrier traps in Czochralski-grown p-type silicon crystals doped with B, Al, Ga, or In impurity atoms

Authors: Joyce Ann T. de Guzman, Vladimir P. Markevich, Simon Hammersley, Ian D. Hawkins, Iain Crowe, Nikolay V. Abrosimov, Robert Falste, Jeff Binns, Pietro Altermatt, Matthew P. Halsall, Anthony R. Peaker

Publication title: 2020 47th IEEE Photovoltaic Specialists Conference (PVSC) (pp. 1013-1018). IEEE

Abstract:

Minority carrier traps in Czochralski-grown (Cz) silicon crystals doped with either boron, aluminum, gallium, or indium impurity atoms have been investigated by means of deep-level transient spectroscopy and other junction-related techniques. The experimental data have suggested that minority carrier trapping effects in Cz-Si samples doped with different acceptor impurities are associated with complexes incorporating a substitutional group-III impurity atom and two oxygen atoms, which are found to be negative-U defects with close locations of E(-/+) occupancy level at about $E_u + 0.32$ eV. We have determined the energy barriers and frequency factors for the reversible transformations of the complexes between deep donor and shallow acceptor states. These parameters are discussed in relation to light-induced degradation behavior of solar cells on p-type Cz-Si crystals.

Full text link <https://tinyurl.com/2p8aw792>

Article title: Formation and Elimination of Electrically-Active Thermally-induced defects in Float-Zone-Grown Silicon Crystals

Authors: De Guzman, Joyce Ann T., Markevich, Vladimir P., Mullins, Jack, Grant, Nicholas E., Murphy, John D., Hiller, Daniel, Halsall, Matthew P. and Peaker, Anthony R.

Publication title: 2021 11th International Conference on Silicon Photovoltaics – Silicon PV 2021. American Institute of Physics.

Abstract:

Understanding the origins of the phenomena that limit the minority carrier lifetime in float-zone-grown silicon (FZ-Si) is an important area in photovoltaics research. Although FZ silicon has been applauded for its stability, purity, and high minority carrier lifetime, it has been found recently that severe degradation of the minority carrier lifetime occurs in FZ-Si crystals upon thermal treatments in the temperature range 400-700 oC and upon light soaking at elevated (~ 100 oC) temperatures. In this work, deep level transient spectroscopy (DLTS) and high-resolution Laplace DLTS have been used to elucidate the formation and elimination processes of the electrically active thermally-induced defects. Float-zone-grown n-type Si crystals with and without added nitrogen from different suppliers have been studied. It has been found that the spectra of deep levels from thermally-induced defects are different in FZ-Si crystals from different manufacturers. Significant qualitative changes were observed in the DLTS spectra after heat-treatments of the FZ-Si samples at different temperatures for different treatment duration. These results indicate various defect reactions occurring upon heat-treatments in FZ-Si materials with varying ensembles of intrinsic defects, doping, and residual impurities in the as-grown state. Also, we have found that hydrogenation from a remote plasma source with subsequent low-temperature annealing has resulted in the total deactivation of thermally-induced defects in FZ silicon.

Full text available upon request to the author

Article title: On the correlation between light-induced degradation and minority carrier traps in boron-doped Czochralski silicon

Authors: Saman Jafari, Yan Zhu, Fiacre Rougieux, Joyce Ann T. De Guzman, Vladimir P. Markevich, Anthony R. Peaker, and Ziv Hameiri

Publication title: ACS Applied Materials & Interfaces 13(5), 2021

Abstract:

Boron-doped Czochralski-grown silicon wafers dominate the photovoltaic market. Light-induced degradation of these wafers is one of the most significant roadblocks for high-efficiency solar cells. Despite a very large number of publications on this topic, only a few studies have directly investigated the precursor of the defect responsible for this degradation. In this study, using the photoconductance decay measurement method, we identify the precursor of the defect responsible for light-induced degradation. By comparing the photoconductance

decay of samples in the different states, we observe the presence of a minority carrier trap in the annealed state, which is not present after degradation. Trap annihilation shows a clear anticorrelation with the generation of the recombination-active boron-oxygen defect, as determined from minority carrier lifetime measurements. Furthermore, it is concluded that a model based on a single-level trap cannot explain the doping-dependent measurements, meaning that the detected trap has two or more energy levels.

Full text available upon request to the author

Article title: Boron-Oxygen Complex Responsible for Light-Induced Degradation in Silicon Photovoltaic Cells: A New Insight into the Problem

Authors: Vladimir P. Markevich, Michelle Vaqueiro-Contreras, Joyce T. De Guzman, José Coutinho, Paulo Santos, Iain F. Crowe, Matthew P. Halsall, Ian Hawkins, Stanislaw B. Lastovskii, Leonid I. Murin, and Anthony R. Peaker

Publication title: Physica Status Solidi (A) Applications and Materials 216(17), July 2019

Abstract:

Results available in the literature on minority carrier trapping and light induced degradation (LID) effects in silicon materials containing boron and oxygen atoms are briefly reviewed. Special attention is paid to the phenomena associated with “deep” electron traps (J.A. Hornbeck and J.R. Haynes, Phys. Rev. 1955, 97, 311) and the recently reported results which have linked LID with the transformation of a defect consisting of a substitutional boron atom and an oxygen dimer (BsO₂) from a configuration with a deep donor state into a recombination active configuration associated with a shallow acceptor state (M. Vaqueiro-Contreras et al., J. Appl. Phys. 2019, 125, 185704). The significance of the latter work is discussed and detailed experimental results on the electronic and dynamic properties of the BsO₂ complex are presented. It is shown that the BsO₂ complex is a defect with negative-U properties and it is responsible for minority carrier trapping and persistent photo-conductivity in non-degraded Si:B+O samples and solar cells. It is argued that the “deep” electron traps observed by Hornbeck and Haynes are the pre-cursors of the “slow” forming shallow acceptor defects, which are responsible for the dominant LID in boron-doped Cz-Si crystals. Both the deep and shallow defects are BsO₂ complexes, transformations between charge states and atomic configurations of which account for the observed electron trapping and LID phenomena.

Full text link <https://tinyurl.com/365h5x5p>

Article title: Kinetics of Bulk Lifetime Degradation in Float-Zone Silicon: Fast Activation and Annihilation of Grown-In Defects and the Role of Hydrogen versus Light

Authors: Daniel Hiller, Vladimir P. Markevich, Joyce Ann T. de Guzman, Dirk König, Slawomir Prucnal, Wolfgang Bock, Jaakko Julin, Anthony R. Peaker, Daniel Macdonald, Nicholas E. Grant, John D. Murphy

Publication title: Physica status solidi (a), 217(17), 2000436, 2020

Abstract:

Float-zone (FZ) silicon often has grown-in defects that are thermally activated in a broad temperature window ($\approx 300\text{--}800\text{ }^{\circ}\text{C}$). These defects cause efficient electron-hole pair recombination, which deteriorates the bulk minority carrier lifetime and thereby possible photovoltaic conversion efficiencies. Little is known so far about these defects which are possibly Si-vacancy/nitrogen-related (V_xN_y). Herein, it is shown that the defect activation takes place on sub-second timescales, as does the destruction of the defects at higher temperatures. Complete defect annihilation, however, is not achieved until nitrogen impurities are effused from the wafer, as confirmed by secondary ion mass spectrometry. Hydrogenation experiments reveal the temporary and only partial passivation of recombination centers. In combination with deep-level transient spectroscopy, at least two possible defect states are revealed, only one of which interacts with H. With the help of density functional theory V1N1 -centers, which induce Si dangling bonds (DBs), are proposed as one possible defect candidate. Such DBs can be passivated by H. The associated formation energy, as well as their sensitivity to light-induced free carriers, is consistent with the experimental results. These results are anticipated to contribute to a deeper understanding of bulk-Si defects, which are pivotal for the mitigation of solar cell degradation processes.

Full text available upon request to the author

Article title: Electrical Characterization of Thermally Activated Defects in n-Type Float-Zone Silicon

Authors: Yan Zhu, Fiacre Rougieux, Nicholas E. Grant, Joyce Ann T. De Guzman, John D. Murphy, Vladimir P. Markevich, Gianluca Coletti, Anthony R. Peaker, and Ziv Hameiri

Publication title: IEEE Journal of Photovoltaics, 2020

Abstract:

Float-zone (FZ) silicon is usually assumed to be bulk defect-lean and stable. However, recent studies have revealed that detrimental defects can be thermally activated in FZ silicon wafers and lead to a reduction of carrier lifetime by up to two orders of magnitude. A robust methodology which combines different characterization techniques and passivation schemes is used to provide new insight into the origin of degradation of $1\text{ }\Omega\text{ cm}$ n-type phosphorus doped FZ silicon (with nitrogen doping during growth) after annealing at $500\text{ }^{\circ}\text{C}$. Carrier lifetime and photoluminescence experiments are first performed with temporary room temperature surface passivation which minimizes lifetime changes which can occur during passivation processes involving thermal treatments. Temperature- and injection-dependent lifetime spectroscopy is then performed with a more stable passivation scheme, with the same samples finally being studied by deep level transient spectroscopy (DLTS). Although five defect levels are found with DLTS, detailed analysis of injection-dependent lifetime data reveals that the most detrimental defect levels could arise from just two independent single-level defects or from one two-level defect. The defect parameters for these two possible scenarios are extracted and discussed.

Full text available upon request to the author

Article title: Boron-oxygen related light-induced degradation of Si solar cells: Transformation between minority carrier traps and recombination active centers

Authors: Anthony R. Peaker, Saman JafariYan ZhuFiacre RougieuxJoyce Ann T. De GuzmanVladimir P. MarkevichZiv Hameiri

Publication title: IEEE-PVSC Proceedings, 2020

Abstract:

Light-induced degradation (LID) has a considerable impact on solar cells made from boron-doped Czochralski (Cz) grown silicon wafers. Thus, a great effort has been made to investigate this type of degradation. Recently, it has been suggested that minority carrier traps are acting as precursors to the LID-related defects and that the enhanced recombination might occur through a trap-assisted Auger process. In this study, we investigate the former suggestion using photoconductance measurement of boron-doped Cz wafers in the course of LID. A clear anti-correlation between minority carrier trap density and LID extent has been found. We detect minority carrier traps in the dark annealed state which disappear upon LID. A time constant of 55 ± 5 min for trap annihilation under 1 sun illumination at 60 °C has been determined, in agreement with previous findings regarding the LID-related defects' formation rate. Additionally, the kinetic of the traps is studied at different temperatures ranging from 25 °C to 100 °C. This study highlights the fact that despite decades of LID-related research, new insights can be obtained when using new approaches, such as those presented in this paper.

Full text available upon request to the author

Article title: New insights into the thermally activated defects in n-type float-zone silicon

Authors: Yan Zhu¹, Fiacre Rougieux, Nicholas Grant, Jack Mullins, Joyce Ann De Guzman, John D. Murphy, Vladimir P. Markevich, Gianluca Coletti¹, Anthony R. Peaker, and Ziv Hameiri

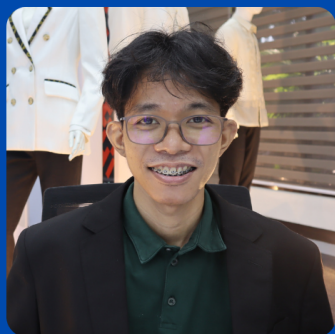
Publication title: AIP Conference Proceedings (Vol. 2147, No. 1, p. 140014). AIP Publishing LLC, 2019

Abstract:

Float-zone silicon has been long assumed to be bulk defect free and stable. Nevertheless, recently it was found that upon annealing between 450 °C to 700 °C detrimental defects can be activated in this material. Previous studies via deep level transient spectroscopy have identified several defect levels. However, it is still not clear which of these levels have a substantial impact on the minority carrier lifetime. In this study, we determine the recombination parameters of the dominant defect level using a combination of deep level transient spectroscopy and temperature and injection dependent lifetime spectroscopy. Additionally, we investigated the effect of hydrogenation on the thermally activated defects in n- type float-zone silicon.

Full text available upon request to the author

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**DR. JOSE PAOLO O. BANTANG***Nanotechnology and Advanced Materials*

Dr. Bantang is one of the S&T Fellows in DOST-PTRI. He received his PhD in Chemistry from the De La Salle University in 2021. His research interests are Nanomaterials and nanocomputers, Dye-Sensitized Solar Cell, and Electrochemistry

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Doctor of Philosophy in Chemistry, De La Salle University, 2021

Master of Science in Chemistry, De La Salle University, 2014

Bachelor of Science in Chemistry for Teachers, Philippine Normal University, 2009

Field of Specialization:

Nanomaterials and nanocomputers

Dye-Sensitized Solar Cell

Electrochemistry

Researches:

Article title: Influence of pre-cursor chemistry in the property of carbon nanodots and its application for degradation of methyl orange.

Authors: Jessa C. Leuterio, Drexel H. Camacho, Jose Paolo O. Bantang, Cristian Ryan A. Argamino

Publication title: Materials Chemistry and Physics, 278 (15), 125668, 2022

Abstract:

Carbon nanodots (CNDs) are interesting materials from renewable sources that exhibit unique fluorescence property. This study reports that sulfated carrageenan (κ -, ι -, λ -) as carbon precursors for CNDs impart unique properties not observed in a non-sulfated source. Hydrothermal process afforded CNDs having quasi-spherical shapes (TEM), nano sizes (TEM: 3.8 nm; DLS 1.0–2.3 nm), luminous green property under UV light, and presence of sulfur in CNDs (EDS, FTIR). The CNDs were embedded in a carrageenan film matrix to prevent its aggregation and to improve its stability affording brown-colored free-standing films that have better stability (zeta potential) compared to bare CNDs in solution. The CNDs from carrageenan exhibited unique acidic property in water, which is not observed in CNDs from galactose indicating that the sulfate-laden carrageenan precursor imparts unique property to the CNDs. Degradation activity on methyl orange (MO) dye was only observed for CNDs derived from

carrageenan and not from galactose confirming the critical role of precursor chemistry in imparting unique acidic properties to the resulting CNDs. The study demonstrated the difference in the carrageenan-based CNDs compared to those prepared from simple sugar and showed its application for the degradation of dyes without the need for direct exposure to sunlight.

Full text available upon request to the author

Article title: Gel and Film Composites of Silver Nanoparticles in κ -, ι -, and λ -Carrageenans: One-Pot Synthesis, Characterization, and Bioactivities.

Authors: Jose Paolo O. Bantang & Ursela G. Bigol & Drexel H. Camacho

Publication title: BioNanoScience 11(1): 53-66, 2021

Abstract:

Gel and film composites containing silver nanoparticles (AgNPs) were biosynthesized using carrageenan as the reducing agent, capping biomolecule, and polymer matrix in one-pot method. A comparison between the in situ syntheses of AgNPs was made between κ -, ι -, and λ -carrageenans. The structure and morphology of AgNPs in the composite were investigated using UV-visible and infrared spectroscopies, scanning and transmission electron microscopies, and thermal gravimetric analysis. The antimicrobial properties were also evaluated. Results showed that AgNPs fabrication was influenced by the carrageenan type, incubation temperature, and carrageenan concentration. High incubation temperature promoted the reduction of AgNPs. κ -Carrageenan showed stronger reduction capabilities of Ag^+ than the other carrageenan types. Gel and film formabilities were also observed to be superior in κ -carrageenan than in the ι -, and λ - types. Higher concentrations (1%) of carrageenans promoted more Ag^+ reduction and less aggregation of AgNPs. The formation of AgNPs was found to be independent of initial Ag^+ concentration and that excess Ag^+ ions are still present in the solution allowing for the formation of stable gel and free-standing film for κ -carrageenan compared with the ι -, and λ -carrageenans incorporating the AgNPs in the composite matrix. Microbial activities show that solutions of carrageenan/AgNP/ Ag^+ are active against bacteria and fungi. Gel and film forms of κ -carrageenan/AgNP/ Ag^+ are also active against bacteria.

Full text link <https://tinyurl.com/3h39zvna>

Article title: Green production of potassium sulfate by hydrothermal carbonization of carrageenan.

Authors: Jose Paolo O. Bantang and Drexel H. Camacho

Publication title: Asian Journal of Chemistry 32(12):3105-3108, 2020

Abstract:

A novel green method of producing potassium sulfate from a sustainable source is described. Aqueous carrageenan is subjected to hydrothermal carbonization inside a pressure vessel. Separation of the liquid component from the hydrochar followed by evaporation to dryness and treatment with ethanol afforded potassium sulfate. Characterization using SEM-EDX, XRD and

Raman spectroscopy confirms the identity of potassium sulfate in the form of $K_3H(SO_4)_2$. The green process allows the facile release of sulfate ester group from the carrageenan chains and combining with the residual potassium ions in the carrageenan. The new method allows for the simplification of the process of producing potassium sulfate in an environmental friendly way and using a renewable source.

Full text available upon request to the author

Article title: Carrageenan-stabilized silver nanoparticle gel probe kit for colorimetric sensing of mercury (II) using digital image analysis.

Authors: Michaela Olisha S. Lobregas, Jose Paolo O. Bantang, Drexel H. Camacho

Publication title: Sensing and Bio-Sensing Research, 26(August): 100303, 2019

Abstract:

Hydrophilic gelling kit consisting of carrageenan-stabilized silver nanoparticles (AgNPs) is described herein as a selective probe for the colorimetric detection of Hg^{2+} . Spherical AgNPs with surface plasmon resonance (SPR) at 430 nm and TEM size of less than 100 nm were synthesized using κ -carrageenan to give a dark brown gelling mixture (Carr-AgNP) that were used directly for colorimetric reaction with various metal ions. The reaction is selective only to Hg^{2+} . The dark brown color of the Carr-AgNP was found to fade as the concentration of Hg^{2+} increases until the mixture turns white. It can detect Hg^{2+} at a concentration of ≥ 350 ppm with limits of detection at 2.92×10^{-4} M. Quantification of the color change was established using digital photometry with strong correlation observed for L^* , R and G color parameters. The role of chlorides in the colorimetric sensing is critical to detecting Hg^{2+} as excess chlorides promote the formation of AgCl as well as the dissolution of AgNP. The utility of the gelling kit was successfully applied for the detection of mercury(II) in a cosmetic cream sample.

Full text available upon request to the author

Article title: Adenosine Triphosphate Templated Self-Assembly of Cationic Porphyrin into Chiral Double Superhelices and Enzyme-Mediated Disassembly.

Authors: Zhiliang Li, Charles J. Zeman IV, Silvano R. Valandro, Jose Paolo O. Bantang, and Kirk S. Schanze

Publication title: Journal of the American Chemical Society 141(32), 2019

Abstract:

Self-assembly of small molecules through non-covalent interactions into nanoscale architectures has been extensively studied in supramolecular chemistry. However, it is still challenging to develop a biologically inspired self-assembly system that functions in water with complex structure and dynamics nature by analogy with those found in nature. Here, we report a new water-soluble cationic porphyrin which undergoes adenosine triphosphate (ATP) templated self-assembly into right-handed double-helical supramolecular structures. Direct observation of the porphyrin-ATP assembly by transmission electron microscopy has been accomplished. The assemblies consist of superhelical fibers with length greater than 1 μ m and width ~ 20 nm. The

chiral superhelical fibers show reversible disassembly to monomers upon hydrolysis of ATP when catalyzed by alkaline phosphatase (ALP), and the nanofibers can be reformed with subsequent addition of ATP. Moreover, a transient self-assembly of a chiral double helix is formed when ALP is present to consume ATP.

Full text link <https://tinyurl.com/3kshrw77>

Article title: Photocathode Chromophore-Catalyst Assembly via Layer-By-Layer Deposition of a Low Band-Gap Isoindigo Conjugated Polyelectrolyte.

Authors: Gyu Leem, Hayden T. Black, Bing Shan, Jose P. O. Bantang, Thomas J. Meyer, John R. Reynolds, and Kirk S. Schanze

Publication title: ACS Applied Energy Materials 1(1):62-67, 2018

Abstract:

Low band-gap conjugated polyelectrolytes (CPEs) can serve as efficient chromophores for use on photoelectrodes for dye-sensitized photoelectrochemical cells. Herein is reported a novel CPE based on poly(isoindigo-co-thiophene) with pendant sodium butylsulfonate groups (PiIT) and its use in construction of layer-by-layer (LbL) chromophore-catalyst assemblies with a Pt-based H⁺ reduction catalyst (PAA-Pt) for water reduction. A novel Stille polymerization/post-polymerization ion-exchange strategy was used to convert an organic soluble CPE to the water-soluble poly(isoindigo-co-thiophene). The anionic PiIT polyelectrolyte and poly-acrylate stabilized Pt-nanoparticles (PAA-Pt) were co-deposited with cationic poly(diallyldimethylammonium) chloride (PDDA) onto inverse opal (IO), nanostructured indium tin oxide film (nITO) (IO nITO) atop fluorine doped tin oxide (FTO) by using LbL self-assembly. To evaluate the performance of novel conjugated PiIT//PAA-Pt chromophore-catalyst assemblies, inter-assembly hole transfer was investigated by photocurrent density measurements on FTO//IO nITO electrodes. Enhanced cathodic photocurrent is observed for the polychromophore-catalyst assemblies, compared to electrodes modified with only PiIT, pointing towards photoinduced hole transfer from the excited PiIT to the IO ITO. Prolonged photoelectrolysis experiments reveal H₂ production with a Faradaic yield of approximately 45%. This work provides new routes to carry out visible-light-driven water reduction using photocathode assemblies based on low band-gap CPEs.

Full text available upon request to the author

Article title: Gelling polysaccharide as the electrolyte matrix in a dye-sensitized solar cell.

Authors: Jose Paolo Bantang and Drexel Camacho

Publication title: Materials and Technologies 51(5):823-829, October 2017

Abstract:

Hydrophilic polysaccharide, κ -carrageenan, was utilized as the polymer matrix in gel-electrolyte systems for dye-sensitized solar-cell (DSSC) applications. The influence of the solvent system was investigated to optimize the solubility of κ -carrageenan and tetrabutylammonium-iodide (TBAI)/I₂ electrolytes by minimizing the water content because of

its unfavorable effect on DSSCs. We report herein that two solvent systems, a water/acetonitrile mixed solvent and DMSO, were found to effectively dissolve the components. The composite natures of the κ -carrageenan-electrolyte systems in these solvents were confirmed with an FTIR analysis. The presence of κ -carrageenan did not impede the electrochemical properties of the electrolytes, as confirmed with cyclic voltammetry, electrochemical impedance spectroscopy and linear sweep voltammetry. The incorporation of the gel electrolytes in DSSCs showed that the DMSO system exhibited better solar-cell efficiency compared to the mixed-solvent system.

Full text link <https://tinyurl.com/mssw4dvc>

Article title: Influence of nanomaterial fillers in biopolymer electrolyte system for squaraine-based dye-sensitized solar cells.

Authors: Stephanie Chan, Jose Paolo Bantang, Drexel Camacho

Publication title: International Journal of Electrochemical Science 10(9): 7696-7706, 2015

Abstract:

The vast use of fossil fuel demands the development of new sources of renewable energy. Dye-sensitized solar cells (DSSCs) have been extensively studied due to their competitive cost, ease of fabrication, high degree of tunability and relatively good-energy conversion efficiencies. The performance and stability of DSSCs are limited by leakage and solvent evaporation. This study explores the effects of nanofillers in the performance of dye-sensitized solar cells by incorporating nano-sized titanium dioxide, iron (III) oxide and halloysite fillers into the polymer electrolytes based on κ -carrageenan/DMSO/TBAI. Optimization and characterization of various concentrations of fillers were done before incorporation in solar cells. The effect of ionic conductivity and diffusion coefficient to the overall conversion efficiency of the cells were studied. The effect of squaraine dye was also investigated. The addition of various fillers to the polymer electrolyte system increased the dissociation of iodide ions and improved the ionic conductivity of the cells. The diffusion coefficient of tri-iodide ions was also greatly enhanced because of the increased volume of the system brought about by reducing polymer-polymer interaction, which increased the mobility of the redox couple (I_3^-/I^-). DSSC characterization revealed a low efficiency due to a relatively high charge transfer resistances at the TiO_2 /dye/electrolyte interface.

Full text link <https://tinyurl.com/489x7xfw>

Article title: Initial Validation of the Chemistry Microlab kit in Facilitating Learning of Selected Chemistry Concepts for K-12 Science.

Authors: Crist John M. Pastor, Fidela Q. Aranes, Janir T. Datukan, Virgil Duad, Jose Paolo O. Bantang, Allen A. Espinosa, Nelson Garcia, Arlyne C. Marasigan, Vic Marie I. Camacho, Adolfo P. Roque, Rebecca C. Nueva España, Ruel A. Avilla, Crisanta A. Ocampo

Publication title: The Normal Lights 9(2), 2015

Abstract:

The introduction of the Chemistry MicroLab Kit (CMLK) aims to assist student learning of chemistry in a more interactive and practical way. Each kit was designed to address certain topics in chemistry that may otherwise be too abstract to do in a lecture-discussion set up. Among the many topics tackled in secondary school, 13 undergraduate students were hand-picked for this preliminary study. The test subjects for this initial phase of the research both majors and non-majors, were currently enrolled in a Chemistry course. It was also tried out at the Institute for Teaching and Learning (formerly Center for Teaching and Learning) with selected third year students. In this preliminary study, the students found three activities to be interesting and well-balanced: Gas Laws in a Box, Particulate Nature of Matter, and Solution Rules. In assessing the activities, they highly rated the easy language used for understanding the procedures, followed by setup of the experiments and a step-by-step presentation of the procedures. Initial results of the study find it a promising addition to the secondary level chemistry activities because CMLK enhances students' attitudes and motivation toward chemistry laboratory work.

Full text available upon request to the author

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**DR. RYAN D. CORPUZ***Nanotechnology and Advanced Materials*

Dr. Corpuz is one of the S&T Fellows at DOST-PCIEERD. He is the co founder of an R&D start-up company called Nanolabs LRC. Co. Ltd., which is oriented in providing nano-based solutions to environmental and societal problems. He has patented several technologies including rechargeable zin-ion batteries, flexible electrodes, and a flexible solid polymer electrolyte-reduce graphene oxide nanocomposite.

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Doctor in Philosophy in Materials Science and Engineering, Hokkaido University Japan, 2017

Master of Science in Materials Science and Engineering University of the Philippines, 2012

Bachelor of Science in Ceramics Engineering, Mindanao State University, 2007

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Rechargeable batteries

Plasma process

Electrophoretic deposition (EPD)

Anodization

Synthesis of Nanomaterials

Photoluminiscent noble metal

Advanced ceramics

Multi-layer ceramic capacitors

Colloids

Researches:

Article title: Binder-Free α -MnO₂ Nanowires on Carbon Cloth as Cathode Material for Zinc-Ion Batteries

Authors: Ryan Dula Corpuz, Lyn Marie De Juan-Corpuz, Mai Thanh Nguyen, Tetsu Yonezawa, Heng-Liang Wu, Anongnat Somwangthanaroj and Soorathep Kheawhom

Publication title: International Journal of Molecular Sciences 21(9): 3113, 2020

Abstract:

Recently, rechargeable zinc-ion batteries (ZIBs) have gained a considerable amount of attention due to their high safety, low toxicity, abundance, and low cost. Traditionally, a composite manganese oxide (MnO₂) and a conductive carbon having a polymeric binder are used as a positive electrode. In general, a binder is employed to bond all materials together and to prevent detachment and dissolution of the active materials. Herein, the synthesis of α -MnO₂

nanowires on carbon cloth via a simple one-step hydrothermal process and its electrochemical performance, as a binder-free cathode in aqueous and nonaqueous-based ZIBs, is duly reported. Morphological and elemental analyses reveal a single crystal α -MnO₂ having homogeneous nanowire morphology with preferential growth along {001}. It is significant that analysis of the electrochemical performance of the α -MnO₂ nanowires demonstrates more stable capacity and superior cyclability in a dimethyl sulfoxide (DMSO) electrolyte ZIB than in an aqueous electrolyte system. This is because DMSO can prevent irreversible proton insertion as well as unfavorable dendritic zinc deposition. The application of the binder-free α -MnO₂ nanowires cathode in DMSO can promote follow-up research on the high cyclability of ZIBs

Full text link <https://doi.org/10.3390/ijms21093113>

Article title: Acid mine drainage formation and arsenic mobility under strongly acidic conditions: Importance of soluble phases, iron oxyhydroxides/oxides and nature of oxidation layer on pyrite,

Authors: Carlito Baltazar Tabelin, Ryan D. Corpuz, Toshifumi Igarashi, Mylah Villacorte-Tabelin, Richard Diaz Alorro, Kyoungkeun Yoo, Simit Raval, Mayumi Ito, Naoki Hiroyoshi

Publication title: Journal of Hazardous Materials 399: 122844, November 2020

Abstract:

Acid mine drainage (AMD) formation and toxic arsenic (As) pollution are serious environmental problems encountered worldwide. In this study, we investigated the crucial roles played by common secondary mineral phases formed during the natural weathering of pyrite-bearing wastes—soluble salts (melanterite, FeSO₄·7H₂O) and metal oxides (hematite, Fe₂O₃)—on AMD formation and As mobility under acidic conditions (pH 1.5–4) prevalent in historic tailings storage facilities, pyrite-bearing rock dumps and AMD-contaminated soils and sediments. Our results using a pyrite-rich natural geological material containing arsenopyrite (FeAsS) showed that melanterite and hematite both directly—by supplying H⁺ and/or oxidants (Fe³⁺)—and indirectly—via changes in the nature of oxidation layer formed on pyrite—influenced pyrite oxidation dynamics. Based on SEM-EDS, DRIFT spectroscopy and XPS results, the oxidation layer on pyrite was mainly composed of ferric arsenate and K-Jarosite when melanterite was abundant with/without hematite but changed to Fe-oxyhydroxide/oxide and scorodite when melanterite was low and hematite was present. This study also observed the formation of a mechanically ‘strong’ coating on pyrite that suppressed the mineral’s oxidation. Finally, As mobility under acidic conditions was limited by its precipitation as ferric arsenate, scorodite, or a Fe/Al arsenate phase, including its strong adsorption to Fe-oxyhydroxides/oxides.

Full text link doi.org/10.1016/j.jhazmat.2020.122844

Article title: Binder-Free Centimeter-Long V₂O₅ Nanofibers on Carbon Cloth as Cathode Material for Zinc-Ion Batteries,

Authors: Lyn Marie De Juan-Corpuz, Ryan Dula Corpuz, Anongnat Somwangthanaroj, Mai Thanh Nguyen, Tetsu Yonezawa, Jianmin Ma and Soorathep Kheawhom

Publication title: Energies 13(1): 31, 2020

Abstract:

Recently, rechargeable aqueous zinc-ion batteries (AZBs) have attracted extensive interest due to their safety, abundance, low cost, and low toxicity. However, aqueous electrolytes require a polymeric binder to prevent dissolution of the active material in addition to its binding properties. This study highlights binder-free, centimeter long, single-crystal, V₂O₅ nanofibers (BCS-VONF) on carbon cloth, as the cathode material for AZBs synthesized via a simple one-step hydrothermal process. BCS-VONF in 3.0 M Zn(OTf)₂ exhibit promising electrochemical performance with excellent capacity retention. Even in the absence of a binder, BCS-VONF were found to be very stable in 3.0 M Zn(OTf)₂. They will not yield to the dissolution and detachment of the active material on the current collector. The novel strategy described in this study is an essential step for the development of BCS-VONF on carbon cloth, as a promising cathode material for AZBs

Full text link <https://doi.org/10.3390/en13010031>

Article title: Improved pyrolysis behavior of ammonium polyphosphate-melamine-expandable (APP-MEL-EG) intumescent fire-retardant coating system using ceria and dolomite as additive for I-beam steel application

Authors: Joshua B. Zoleta, Gevelyn B. Itao, Vannie Joy T. Resabal, Arnold A. Lubguban, Ryan D. Corpuz, Mayumi Ito, Naoki Hiroyoshi, Carlito Baltazar Tabelin

Publication title: Heliyon 6(1): e03119, January 2020

Abstract:

This study describes the effects of ceria (CeO₂) and dolomite [CaMg(CO₃)₂] additives on the pyrolysis behavior and fire resistive property of conventional intumescent flame retardant (IFR) coating system for I-beam steel substrate called ammonium polyphosphate-melamine-expandable graphite (APP-MEL-EG) system. The fire resistance of various formulations was evaluated using the standard vertical Bunsen burner fire test. Thermogravimetric analysis (TGA) was used to understand the degradation of coating formulations. Observations by scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDX) demonstrated that significant amounts of additives favored the formation of homogeneous compacted char structures, which were predominantly composed of carbon (C), phosphorus (P) and oxygen (O). These three main components of the char were also found to be in various binding combinations with other lighter elements like nitrogen (N) and hydrogen (H) as illustrated by the attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy results. X-ray photoelectron spectroscopy (XPS) further suggest that polyethylene([-(CH₂-C₂H₂-CH₂)_n-]) free radicals were abundant on the char surface for the two best formulations and the binding energy of this radical promoted the formation of aromatic carbon chains that enhanced the char's thermal stability. This means that the selection

of appropriate additives and combinations of flame-retardant ingredients could significantly change the morphology of the char layer and improve its thermal stability during fire exposure.

Full text available upon request to the author

Article title: Annealing induced a well-ordered single crystal δ -MnO₂ and its electrochemical performance in zinc-ion battery,

Authors: Ryan Dula Corpuz, Lyn Marie Z. De Juan, Supareak Praserttham, Rojana Pornprasertsuk, Tetsu Yonezawa, Mai Thanh Nguyen & Soorathep Kheawhom

Publication title: Scientific Reports 9: 15107, 2019

Abstract:

Herein, the formation and electrochemical performance of a novel binder-free turbostratic stacked/ well-ordered stacked δ -MnO₂-carbon fiber composite cathodes in deep eutectic solvent (DES) based zinc-ion battery (ZIB) is reported. Results of morphological, elemental, and structural analyses revealed directly grown and interconnected δ -MnO₂ crumpled nanosheets on a carbon fiber substrate. Moreover, an improvement via a simple annealing strategy in the stacking, surface area and conductivity of the δ -MnO₂ sheets was observed. Annealing induces the rearrangement of δ -MnO₂ sheets resulting in the transformation from turbostratic stacking to a well-ordered stacking of δ -MnO₂ sheets, as indicated by the selected area electron diffraction (SAED) hexagonal single crystal pattern. Besides, the formation of the well-ordered stacking of δ -MnO₂ sheets exhibited improved electrochemical performance and cyclability, as cathode material for ZIB. The novel strategy described in this study is an essential step for the development of binder-free δ -MnO₂-C fiber composite with a well-ordered stacking of δ -MnO₂ sheets. This study also demonstrated comparable electrochemical performance between the turbostratic δ -MnO₂ sheets and the well-ordered stacked δ -MnO₂ sheets.

Full text link <https://tinyurl.com/3627hrvv>

Article title: Hematite-catalysed scorodite formation as a novel arsenic immobilisation strategy under ambient conditions

Authors:

Publication title: Carlito Baltazar Tabelin, Ryan D. Corpuz, Toshifumi Igarashi, Mylah Villacorte-Tabelin, Mayumi Ito, Naoki Hiroyoshi

Abstract:

Scorodite is an important mineral not only for arsenic (As) removal from industrial wastewaters but also in the mobility and final fate of As in waste rocks, contaminated soils and sediments, and mine tailings. Because of the mineral's high As-loading capacity and stability, numerous studies have been done to understand its formation. Unfortunately, most of these studies were limited to elevated temperatures (>70 °C), so the processes involved in scorodite formation under ambient conditions remain unclear. This study provides evidence of the catalytic effects of hematite on the formation of scorodite at 25 °C in a pyrite-rich natural geologic material. Scorodite peaks were detected in the XRD patterns of the leaching residues with and without

hematite, but those in the former were stronger and more pronounced than the latter. These results suggest that the formation of scorodite was catalysed by hematite, a generalisation that is further supported by strong characteristic IR absorption bands of scorodite at 819 cm^{-1} (As–O bending vibration), 785 and 725 cm^{-1} (As–O stretching vibrations), and 2990 cm^{-1} (OH-vibration) as well as the distinct XPS binding energies of Fe(III)–As (709.7 eV), As(V)–O (44.8, 44.31 and 43.7 eV), O $^{2-}$ (530.5 eV) and coordinated water (531.3 eV) in scorodite. This phenomenon could be attributed to three possible mechanisms: (1) more rapid precipitation promoted by the “seeding” effect of hematite particles, (2) additional supply of Fe $^{3+}$ from hematite dissolution under acidic conditions, and (3) enhanced oxidations of Fe $^{2+}$ to Fe $^{3+}$ and As(III) to As(V) on the surface of hematite.

Full text available upon request to the author

Article title: Porous ZnV 2O_4 Nanowires for Stable and High-rate Lithium Ion Battery Anodes

Authors: Lyn Marie Z. De Juan-Corpuz, Mai Thanh Nguyen, Ryan D. Corpuz, Tetsu Yonezawa*, Nataly Carolina Rosero-Navarro, Kiyoharu Tadanaga, Tomoharu Tokunaga, and Soorathep Kheawhom

Publication title: ACS Applied Nano Materials 2(7): 4247-4256, 2019

Abstract:

Porous ZnV 2O_4 nanowires (NWs) were successfully prepared by hydrothermal reaction followed by calcination. Despite the porous structure, these porous ZnV 2O_4 NWs are single crystal with {220} facets and a wire direction along the c-axis. On the basis of an electrochemical test, these porous ZnV 2O_4 NWs have better cycling stability and higher specific capacity (i.e., 460 mA h g $^{-1}$ after 100 cycles and 149 mA h g $^{-1}$ after 1000 cycles using 1 and 5 A g $^{-1}$ current densities, respectively) compared to other morphologies (i.e., spherical and coral-like morphologies). As a ternary transition metal oxide, the produced porous ZnV 2O_4 NWs undergo phase transformation without compromising the resulting capacity. On the other hand, the CV curves at different scan rates indicate a pseudocapacitive electrochemical behavior of the porous ZnV 2O_4 .

Full text available upon request to the author

Article title: CeO 2-dolomites as fire retardant additives on the conventional intumescent coating in steel substrate for improved performance,

Authors: Joshua Zoleta, Gevelyn Itao, Vannie Joy Resabal, Arnold Lubguban, Ryan Corpuz, Carlito Tabelin, Mayumi Ito and Naoki Hiroyosh

Publication title: MATEC Web Conferences 268: 04009, 2019

Abstract:

Multiple combinations of CeO $_2$ -Dolomite as fillers and Intumescent Flame Retardant (IFR) ingredients were used to optimize the intumescent coatings designed for I-beam steel substrates. The influenced of fillers and various combinations of flame-retardants on the fire protective performance of the coatings were evaluated using vertical Bunsen burner fire test and

various characterization techniques. Formula C and Formula F having 1:1 and 2:2 CeO₂-Dolomite ratio, obtained the lowest substrate temperature around 150°C and 150.4°C, respectively after 90 minutes fire exposure. Also, the morphological structures of intumescent char observed by SEM-EDX, demonstrated that Formula C and Formula F stimulated the formation of homogeneous and more compacted surface structure. X-ray photoelectron spectroscopy (XPS) provide the binding energies of C and O constituents, it was observed that $[-(C_2H_4)_n-]$ was the most important free radical as it could promote the formation of aromatic carbon chain in the char surface. Finally, the findings of this study revealed that the selection of appropriate fillers and combinations of flame-retardant ingredients significantly influenced the morphological structure of the char layer, of which, Formula C and Formula F produced a char with higher thermal stability, resulting to a more fire resistive IFR coating during fire exposure.

Full text available upon request to the author

Article title: Synthesis of positively charged photoluminescent bimetallic Au-Ag nanoclusters by double target sputtering method on a biocompatible polymer matrix

Authors: Ryan D. Corpuz, Yohei Ishida, Mai Thanh Nguyen, and Tetsu Yonezawa

Publication title: Langmuir 2017 33(36): 9144-9150, 2017

Abstract:

Herein, we report a novel positively charged photoluminescent Au-Ag bimetallic nanocluster synthesized using 11-mercaptopundecyl-N,N,N-trimethylammonium bromide as the capping ligand by means of “green” double-target sputtering method on a biocompatible polymer matrix. The photoluminescent Au-Ag bimetallic cluster showed emission tunability from blue to near infrared (NIR) regions with respect to change in the composition.

Full text available upon request to the author

Article title: Synthesis of cationically charged photoluminescent Coinage Metal Nanoclusters by Sputtering over Liquid Polymer Matrix

Authors: Ryan D. Corpuz, Yohei Ishida and Tetsu Yonezawa

Publication title: New Journal of Chemistry 41: 6828-6833, 2017

Abstract:

This study demonstrates a novel synthesis of cationically charged photoluminescent noble metal nanoclusters of Au, Ag, and Cu; these are known plasmonic elements utilizing 11-mercaptopundecyl-N,N,N-trimethyl ammonium bromide as a stabilizing and capping ligand via sputtering deposition over a liquid polymer matrix.

Full text available upon request to the author

Article title: Controlling an electrostatic repulsion by oppositely charged surfactants towards positively charged fluorescent gold nanoclusters

Authors: Ryan D. Corpuz, Yohei Ishida and Tetsu Yonezawa

Publication title: Physical Chemistry Chemical Physics 18: 8773-8776, 2016

Abstract:

A novel positively charged fluorescent gold nanocluster was successfully synthesized using the shortest cationic thiol, thiocholine. Effective control of electrostatic repulsion by the introduction of an anionic surfactant afforded a nanocluster that showed blue fluorescence emission.

Full text link <https://tinyurl.com/mpzhjymf>

Article title: Water-Dispersible Fluorescent Silver Nanoparticles via Sputtering Deposition over Liquid Polymer Using a Very Short Thiol Ligand

Authors: Yohei Ishida, Ryota Nakabayashi, Ryan D. Corpuz, Tetsu Yonezawa

Publication title: Colloids and Surfaces A: Physicochemical and Engineering Aspects 518: 25-29, 2017

Abstract:

We have developed a novel physical approach for size-controlled synthesis of metal nanoparticles via sputtering deposition over liquid matrix. Here we report a novel water-dispersible, negatively charged fluorescent silver nanoparticles through this method with a very short anionic thiolate ligand. Our previous result showed that multiple hydrogen bonds between carboxylic groups in surface ligands resulted in a very poor dispersibility of formed nanoparticles, however neutralized sodium 3-mercaptopropionate used in this work could overcome this limitation. We successfully obtained NIR fluorescent, water-dispersible silver nanoparticles for the first time among physical-based approach. Results presented here therefore will widen the spectrum of novel and environmental-friendly strategy for functionalized metal nanoparticles or fluorescent clusters.

Full text available upon request to the author

Article title: Electrophoretic fabrication of ZnO/ZnO-CuO composite for ammonia gas sensing

Authors: Ryan Dula Corpuz and Jason Rayala Albia

Publication title: Materials Research 17(4): 851-856, 2014

Abstract:

Nanostructured deposits of ammonia (NH₃) sensitive ZnO and ZnO-CuO composites were fabricated on a graphite electrode via electrophoretic deposition (EPD). Deposition was done by holding the applied voltage and deposition time constant at room temperature. Testing of sensing properties of the deposits was conducted using Wheatstone bridge circuit. SEM micrographs show a more open structure and more exposed surface area of the pure ZnO deposit compared to the ZnO-CuO deposit. The average particle size deposited at 500V for ZnO and ZnO-CuO were 241nm and 260nm respectively; whereas at 750V the average particle size is 195nm and 276nm, respectively. Deposits with greater surface area, smaller particle sizes and thicker deposits exhibit high gas sensitivity. On the other hand, addition of CuO resulted to a

more compact and dense surface structure and decreased gas sensitivity. Thus, particle size and the surface structure of the deposits dictate the sensitivity of the material.

Full text link <https://tinyurl.com/3h9y3h3z>

Papers Presented:

Article title: Photoluminescent Bimetallic Nanoclusters by Sputtering Technique

Authors: Ryan Dula Corpuz

Conference title: 8th International Colloids Conference, Fudan University, Shanghai, China, 10-13 June 2018

Article title: Synthesis of cationic mono- and bi-metallic nanoparticles with unique photo fluorescent property via sputtering method

Authors: I. Akita, Y. Ishida, R. D. Corpuz and T. Yonezawa

Conference title: The 98th Annual Meeting of Chemical Society of Japan, Nihon University, College of Science and Technology, Chiba, Japan, 20-23 March 2018

Article title: Sputtering Technique: A greener strategy to produce photoluminescent bimetallic nanoclusters

Authors: Ryan Dula Corpuz

Conference title: The Energy Materials and Nanotechnology Meeting on Ceramics, Las Vegas, USA, 27 February–10 March 2018

Article title: Synthesis of cationically charged photoluminescent bimetallic Au-Ag nanocluster with tunable emission by double target sputtering method

Authors: R. D. Corpuz, Y. Ishida and T. Yonezawa

Conference title: The Chemical Society of Japan Hokkaido Section 2017 Summer Study Presentation, Asahikawa National College of Technology, Asahikawa, Hokkaido, Japan, 22 July

Article title: Synthesis of Cationically Charged Photoluminescent Noble Metal Nanoclusters by sputtering over liquid polymer matrix

Authors: R. D. Corpuz, Y. Ishida and T. Yonezawa

Conference title: The 15th Annual meeting of Society of Nano Science and Technology Hokkaido Citizen Activity Center, Sapporo, Hokkaido, Japan, 10-12 May 2017

Article title: Effect of Cationic Thiol Ligand and Anionic Surfactant on the Synthesis of Fluorescent Gold Nanocluster

Authors: R. D. Corpuz, Y. Ishida and T. Yonezawa

Conference title: The 64th SPSJ (The Society of Polymer Science, Japan) Annual Meeting, Sapporo Convention Center, Sapporo, Hokkaido, Japan, 27-29 May 2015

Article title: Electrophoretic Fabrication of Superhydrophobic Silica-Stainless Steel Composite

Authors: Ryan Dula Corpuz

Conference title: 5th International Conference on Electrophoretic Deposition: Fundamentals and Applications (EPD 2014), Hernstein Castle, Austria, 5-10 October 2014

Article title: Electrophoretic Classification of Ultrafine Silica Particles in Dilute Aqueous Suspensio006E

Authors: Ryan Dula Corpuz

Conference title: 5th International Conference on Electrophoretic Deposition: Fundamentals and Applications (EPD 2014), Hernstein Castle, Austria, 5-10 October 2014

Article title: Electrophoretic Classification of Ultrafine Silica particles in Dilute Aqueous Suspension

Authors: Ryan Dula Corpuz

Conference title: Baku World Forum of Young Scientists 2014, Baku, Azerbaijan, 26-31 May

Article title: Porous Single Crystal ZnV_2O_4 as Anode Material for Lithium-ion Battery

Authors: L. M. D. Corpuz, and R. D. Corpuz,

Conference title: The First International Ceramics Research Colloquium “Ceramics: Innovation for Education and Community Building”, Iligan Institute of Technology, Mindanao State University, Iligan City, Lanao del Norte, Philippines, 18-19 September 2018

Article title: Electrophoretic Classification of Ultrafine Silica Particles in Dilute Aqueous Suspension and Its Application on Superhydrophobicity of Stainless Steel Substrate

Authors: Ryan Dula Corpuz

Conference title: Ceramics Forum of the 1st Ceramics Engineering Week Celebration, College of Engineering amphitheater, Mindanao State University-Iligan Institute of Technology, Philippines, 10 February 2014

Article title: Modified Silica Superhydrophobic Coating on Stainless Steel

Authors: L. M. Z. De Juan and R. D. Corpuz,

Conference title: Proceedings of the Samahang Pisika ng Pilipinas

Article title: Fabrication of Highly Ordered Alumina Template

Authors: R. D. Corpuz and L. M. Z. De Juan,

Conference title: MICROSPHIL 2012 “Advancing National Development Through Microscopy Research” the 12th Scientific Conference and General Assembly, CSB International Hotel, Taft Avenue, Manila, Philippines, 29-30 March.

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DR. PHOEBE NICOLE PEREZ

Biomedical Devices

Dr. Perez specializes in ultrafast laser spectroscopy. Currently, she is one of the S&T Fellows at DOST-PCHRD. She participates in multiple research and development/projects involving carbon quantum dots, mixed crystals, and other photoluminescent materials

Sex: Female

Education:

Doctor of Philosophy in Physics, National Sun Yat-sen University, Taiwan, 2021

Bachelor of Science in Applied Physics, University of the Philippines Los Baños, 2016

Field of Specialization:

Quantum mechanics

Semiconductor optics

Statistical mechanics

Classical mechanics

Electrodynamics

Condensed Matter Physics

Researches:

Article title: Temperature-dependent photoluminescence of carbon quantum dots

Authors: Phoebe Nicole G. Perez

Publication title: Bulletin of the American Physical Society 65, 2020

Abstract:

No available

Full text available upon request to the author

Article title: Photoluminescence and time-resolved photoluminescence study of GaSe_{1-x}S_x mixed crystal

Authors: Phoebe Nicole G. Perez, Wen-Ching Chao, Li-Wei Tu, Ching-Hwa Ho, Meng-En Lee, Emmanuel A. Florido, Der-Jun Jang

Publication title: Proceedings Volume 11274, Physics and Simulation of Optoelectronic Devices XXVIII; 112742J (2020)

Abstract:

GaSe_{1-x}S_x mixed crystals have recently drawn worldwide attention owing to their wide bandgap, which can be tuned by varying the ratio between Se and S. We have addressed the scarcity of comprehensive studies on its dynamic properties by investigating the photoluminescence (PL) and time-resolved photoluminescence (TRPL) of GaSe_{1-x}S_x ($x = 0, 0.1, 0.2, 0.5$) mixed crystals at different temperatures (14 – 300 K) using 404 nm excitation from a Ti:Sapphire laser. This paper aims to show that the PL spectra and the lifetime of GaSe_{1-x}S_x could be used to determine the stacking type and composition of the sample. Three Gaussian peaks were deconvoluted from the obtained PL spectrum and were attributed to excitons from the direct and indirect bandgaps. As the sulfur composition increases, the color of the emission changes and the PL spectra exhibits a blueshift. Selenium-rich samples, which have a ϵ -stacking, have an orange emission while sulfur-rich samples, which have a ϵ - β mixed stacking, have a yellow to green emission. TRPL results reveal that the lifetime becomes longer as the sulfur composition increases. The stacking type influences the separation and transfer of the carriers. Hence, sulfur-rich samples have a significantly longer lifetime than selenium-rich samples due to their β -stacking. As the temperature increases, the lifetime also becomes longer due to the increase of the non-radiative recombination rate, which plays a dominant role in the PL emission. These results are useful for the development of GaSe_{1-x}S_x-based optoelectronic devices in the red to the blue visible region.

Full text available upon request to the author

Article title: Photoluminescence of CuInSe₂/GaN and CuInSe₂/InN

Authors: Phoebe Nicole G. Perez, Cheng-Chang Yu, Cheng-Hung Shih, Chen-Chi Yang, Emmanuel A. Florido, Dah-Chin Ling, Der-Jun Jang

Publication title: Journal of Luminescence 213:364-369, September 2019

Abstract:

The power and temperature dependent photoluminescence (PL) of epitaxially grown In-rich CuInSe₂ (CIS) and Cu-rich CIS deposited on N-polar GaN and InN were investigated in this paper. The In-rich CIS/GaN has two PL emissions characterized by a donor-acceptor pair (DAP) peak at 0.92 eV and an excitonic peak at 1.08/1.1 eV. On the other hand, the Cu-rich CIS/GaN has four PL emissions characterized by two DAP peaks at 0.86 eV and 0.94 eV, free-to-bound recombination peak at 0.97 eV and an excitonic peak at 1.03 eV. Identification of these defects in the CIS absorber layer is crucial for the improvement of the device efficiency. The PL emission of the CIS/InN closely resembles that of the Cu-rich CIS/GaN. For all the samples, the PL intensity increased with excitation power while the PL intensity decreased with temperature. The obtained power coefficients and activation energies support the proposed mechanism causing the luminescence. The defects present in CIS/GaN and CIS/InN were also identified. The results from this study are consistent with those of CIS single crystals and show that the CIS absorber layer can be incorporated with III-nitride materials, and its absorption can be extended beyond the spectrum covered by plain CIS.

Full text available upon request to the author

Article title: Conducting Properties of Polyaniline Emeraldine Salt on Paper in the Low-Frequency Region

Authors: Phoebe Nicole G. Perez

Conference title: 2017 International Conference on Frontiers of Composite Materials

Abstract:

Polyaniline emeraldine salt (PAni-ES) was successfully deposited on paper through layer-by-layer technique. In this method, a paper was alternately dipped in aniline monomer and an oxidizing agent for different dipping cycles. This process produced green PAni-ES on paper. The morphology of the samples showed polymeric networks with pores, fiber-like structures and aggregates. There is a transition from frequency-independent to frequency-dependent conductivities of the samples. The conductivity increased with increasing number of dipping cycles. The frequency-dependent conductivities follow the power-law behavior reflecting conducting network and hopping mechanisms. Lastly, the conductivities with frequency followed a scaling behavior reflecting a common physical mechanism in PAni-ES on paper.

Full text available upon request to the author

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DR. CHRISTIAN P. CRISOSTOMO

Electronics

Dr. Crisostomo is one of the S&T Fellows of DOST-PCIEERD. His research of interests are condensed matter physics, first-principles calculations, topological materials, graphene, advanced 2D materials, thermodynamics of lower mantle materials, and molecular solids at high PT condition, surface science, code debugging, and device drivers.

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Education:

Doctor of Philosophy in Physics, National Sun Yat-Sen, University of Kaohsiung Taiwan, 2018

Master of Science in Physics, National Sun Yat-Sen, University of Kaohsiung Taiwan, 2015

Bachelor of Science in Applied Physics, University of the Philippines Los Baños, 2012

Field of Specialization:

Condensed matter theory

Spintronics

Theoretical Condensed Matter Physics

Electronic Structure

Quantum Mechanics

Density Functional Theory

Computational Materials Science

Material Modeling

Quantum Chemistry

Molecular Dynamics Simulation

Researches:

Article title: Quantum anomalous Hall insulator phases in Fe-doped GaBi honeycomb

Authors: Zhi-Quan Huang, Chia-Hsiu Hsu, Christian P. Crisostomo, Gennevieve Macam Jing-Rong Su, HsinLin, Arun Bansil, Feng-Chuan Chuang

Publication title: Chinese Journal of Physics 67: 246-252, October 2020

Abstract:

We discuss electronic and magnetic properties of the Fe-doped GaBi honeycomb using first principles calculations. Our analysis shows that the pristine GaBi honeycomb transitions from being a two-dimensional quantum spin Hall (QSH) insulator to a quantum anomalous Hall (QAH) insulator when it is doped with one Fe atom in a 4×4 GaBi honeycomb. The QAH phase in Fe-doped GaBi is found to be robust in that it maintains its Chern number ($C = 1$)

under fairly large strains ($\sim 4\%$) and supports a gap as large as 112 meV at 2.21% strain. The QAH phase is also retained when the Fe-doped GaBi is placed on a CdTe substrate, suggesting that Fe-doped GaBi films could be useful for spintronics applications.

Full text available upon request to the author

Article title: Thickness dependent electronic properties of Pt dichalcogenides

Authors: Rovi Angelo B. Villaos, Christian P. Crisostomo, Zhi-Quan Huang, Shin-Ming Huang, Allan Abraham B. Padama, Marvin A. Albao, Hsin Lin & Feng-Chuan Chuang

Publication title: npj 2D Materials and Applications 3(1), December 2019

Abstract:

Platinum-based transition metal dichalcogenides have been gaining renewed interest because of the development of a new method to synthesize thin film structures. Here, using first-principles calculation, we explore the electronic properties of PtX_2 ($X = \text{S}, \text{Se}, \text{and Te}$) with respect to film thickness. For bulk and layered structures (1 to 10 layers), octahedral 1T is the most stable. Surprisingly, we also find that the 3R structure has comparable stability relative to the 1T, implying possible synthesis of 3R. For a bulk 1T structure, PtS_2 is semiconducting with an indirect band gap of 0.25 eV, while PtSe_2 and PtTe_2 are both semi-metallic. Still, all their corresponding monolayers exhibit an indirect semiconducting phase with band gaps of 1.68, 1.18, and 0.40 eV for PtS_2 , PtSe_2 , and PtTe_2 , respectively. For the band properties, we observe that all these materials manifest decreasing/closing of indirect band gap with increasing thickness, a consequence of quantum confinement and interlayer interaction. Moreover, we discover that controlling the thickness and applying strain can manipulate van Hove singularity resulting to high density of states at the maximum valence band. Our results exhibit the sensitivity and tunability of electronic properties of PtX_2 , paving a new path for future potential applications.

Full text link <https://tinyurl.com/3jfcrkad>

Article title: Prediction of Quantum Anomalous Hall Effect in MBi and MSb (M:Ti, Zr, and Hf) Honeycombs

Authors: Zhi-Quan Huang, Wei-Chih Chen, Gennevieve M. Macam, Christian P. Crisostomo, Shin-Ming Huang, Rong-Bin Chen, Marvin A. Albao, Der-Jun Jang, Hsin Lin & Feng-Chuan Chuang

Publication title: Nanoscale Research Letters 13, 2018

Abstract:

The abounding possibilities of discovering novel materials has driven enhanced research effort in the field of materials physics. Only recently, the quantum anomalous hall effect (QAHE) was realized in magnetic topological insulators (TIs) albeit existing at extremely low temperatures. Here, we predict that MPn ($M = \text{Ti}, \text{Zr}, \text{and Hf}; \text{Pn} = \text{Sb and Bi}$) honeycombs are capable of possessing QAH insulating phases based on first-principles electronic structure calculations. We found that HfBi, HfSb, TiBi, and TiSb honeycomb systems possess QAHE with the largest band

gap of 15 meV under the effect of tensile strain. In low-buckled HfBi honeycomb, we demonstrated the change of Chern number with increasing lattice constant. The band crossings occurred at low symmetry points. We also found that by varying the buckling distance we can induce a phase transition such that the band crossing between two Hf d-orbitals occurs along high-symmetry point K2. Moreover, edge states are demonstrated in buckled HfBi zigzag nanoribbons. This study contributes additional novel materials to the current pool of predicted QAH insulators which have promising applications in spintronics.

Full text link <https://tinyurl.com/yfty4yfc>

Article title: Chemically induced large-gap quantum anomalous Hall insulator states in III-Bi honeycombs

Authors: Christian P. Crisostomo, Zhi-Quan Huang, Chia-Hsiu Hsu, Feng-Chuan Chuang, Hsin Lin & Arun Bansil

Publication title: Computational Materials volume 3, 2017

Abstract:

The search for novel materials with new functionalities and applications potential is continuing to intensify. Quantum anomalous Hall (QAH) effect was recently realized in magnetic topological insulators (TIs) but only at extremely low temperatures. Here, based on our first-principles electronic structure calculations, we predict that chemically functionalized III-Bi honeycombs can support large-gap QAH insulating phases. Specifically, we show that functionalized AlBi and TlBi films harbor QAH insulator phases. GaBi and InBi are identified as semimetals with non-zero Chern number. Remarkably, TlBi exhibits a robust QAH phase with a band gap as large as 466 meV in a buckled honeycomb structure functionalized on one side. Furthermore, the electronic spectrum of a functionalized TlBi nanoribbon with zigzag edge is shown to possess only one chiral edge band crossing the Fermi level within the band gap. Our results suggest that III-Bi honeycombs would provide a new platform for developing potential spintronics applications based on the QAH effect.

Full text link <https://tinyurl.com/28uftxtt>

Article title: Quantum anomalous Hall insulator phase in asymmetrically functionalized germanene

Authors: Chia-Hsiu Hsu, Yimei Fang, Shunqing Wu, Zhi-Quan Huang, Christian P. Crisostomo, Yu-Ming Gu, Zi-Zhong Zhu, Hsin Lin, Arun Bansil, Feng-Chuan Chuang, and Li Huang

Publication title: Physical Review B 96:165426, October 2017

Abstract:

Using first-principles computations, we discuss topological properties of germanene in buckled as well as planar honeycombs with asymmetric passivation via hydrogen and nitrogen (GeHN) atoms. GeHN in the planar structure is found to harbor a quantum anomalous Hall (QAH) insulator phase. Our analysis indicates that the buckled GeHN also possesses a QAH phase under tensile strain. We computed the associated Chern numbers and edge states to confirm the

presence of the QAH state. In particular, chiral edge bands connecting conduction and valence bands were found at the edges of a planar zigzag GeHN nanoribbon. By considering a range of buckling distances, we demonstrate how the system undergoes the transition from the trivial to the QAH phase between the buckled and planar structures. Finally, we show CdTe(111) to be a suitable substrate for supporting buckled germanene in the QAH phase. Our results suggest that functionalized germanene could provide a robust QAH-based platform for spintronics applications.

Full text available upon request to the author

Article title: Two-dimensional Topological Crystalline Insulator Phase in Sb/Bi Planar Honeycomb with Tunable Dirac Gap

Authors: Chia-Hsiu Hsu, Zhi-Quan Huang, Christian P. Crisostomo, Liang-Zi Yao, Feng-Chuan Chuang, Yu-Tzu Liu, Baokai Wang, Chuang-Han Hsu, Chi-Cheng Lee, Hsin Lin & Arun Bansil

Publication title: Scientific Reports 6, 2016

Abstract:

We predict planar Sb/Bi honeycomb to harbor a two-dimensional (2D) topological crystalline insulator (TCI) phase based on first-principles computations. Although buckled Sb and Bi honeycombs support 2D topological insulator (TI) phases, their structure becomes planar under tensile strain. The planar Sb/Bi honeycomb structure restores the mirror symmetry and is shown to exhibit non-zero mirror Chern numbers, indicating that the system can host topologically protected edge states. Our computations show that the electronic spectrum of a planar Sb/Bi nanoribbon with armchair or zigzag edges contains two Dirac cones within the band gap and an even number of edge bands crossing the Fermi level. Lattice constant of the planar Sb honeycomb is found to nearly match that of hexagonal-BN. The Sb nanoribbon on hexagonal-BN exhibits gapped edge states, which we show to be tunable by an out-of-the-plane electric field, providing controllable gating of edge state important for device applications.

Full text link <https://tinyurl.com/hxpsjb39>

Article title: Prediction of Quantum Anomalous Hall Insulator in half-fluorinated GaBi Honeycomb

Authors: Sung-Ping Chen, Zhi-Quan Huang, Christian P. Crisostomo, Chia-Hsiu Hsu, Feng-Chuan Chuang, Hsin Lin & Arun Bansil

Publication title: Scientific Reports 6, 2016

Abstract:

Using first-principles electronic structure calculations, we predict half-fluorinated GaBi honeycomb under tensile strain to harbor a quantum anomalous Hall (QAH) insulator phase. We show that this QAH phase is driven by a single inversion in the band structure at the Γ point. Moreover, we have computed the electronic spectrum of a half-fluorinated GaBi nanoribbon with zigzag edges, which shows that only one edge band crosses the Fermi level within the band gap. Our results suggest that half-fluorination of the GaBi honeycomb under

tensile strain could provide a new platform for developing novel spintronics devices based on the QAH effect.

Full text link <https://tinyurl.com/59tbj7d7>

Article title: Prediction of two-dimensional topological insulator by forming a surface alloy on Au/Si(111) substrate

Authors: Feng-Chuan Chuang, Chia-Hsiu Hsu, Hsin-Lei Chou, Christian P. Crisostomo, Zhi-Quan Huang, Shih-Yu Wu, Chien-Cheng Kuo, Wang-Chi V. Yeh, Hsin Lin, and Arun Bansil

Publication title: Physical Review B 93, 2016

Abstract:

Two-dimensional (2D) topological insulators (TIs), which can be integrated into the modern silicon industry, are highly desirable for spintronics applications. Here, using first-principles electronic structure calculations, we show that the Au/Si(111)- $\sqrt{3}$ substrate can provide a platform for hosting 2D TIs obtained through the formation of surface alloys with a honeycomb pattern of adsorbed atoms. We systematically examined elements from groups III to VI of the periodic table at $2/3$ monolayer coverage on Au/Si(111)- $\sqrt{3}$, and found that In, Tl, Ge, and Sn adsorbates result in topologically nontrivial phases with band gaps varying from 0 to 50 meV. Our scanning tunneling microscopy and low-energy electron diffraction experiments confirm the presence of the honeycomb pattern when Bi atoms are deposited on Au/Si(111)- $\sqrt{3}$, in accord with our theoretical predictions. Our findings pave the way for using surface alloys as a potential route for obtaining viable 2D TI platforms.

Full text available upon request to the author

Article title: Robust Large Gap Two-Dimensional Topological Insulators in Hydrogenated III-V Buckled Honeycombs

Authors: Christian P. Crisostomo, Liang-Zi Yao, Zhi-Quan Huang, Chia-Hsiu Hsu, Feng-Chuan Chuang, Hsin Lin, Marvin A. Albao, and Arun Bansil

Publication title: Nano Letters 15(10), September 2015

Abstract:

A large gap two-dimensional (2D) topological insulator (TI), also known as a quantum spin Hall (QSH) insulator, is highly desirable for low-power-consuming electronic devices owing to its spin-polarized back-scattering-free edge conducting channels. Although many freestanding films have been predicted to harbor the QSH phase, band topology of a film can be modified substantially when it is placed or grown on a substrate, making the materials realization of a 2D TI challenging. Here we report a first-principles study of possible quantum spin Hall (QSH) phases in 75 binary combinations of group III (B, Al, Ga, In, and Tl) and group V (N, P, As, Sb, and Bi) elements in the 2D buckled honeycomb structure, including hydrogenation on one or both sides of the films to simulate substrate effects. A total of six compounds (GaBi, InBi, TlBi, TlAs, TlSb, and TiN) are identified to be nontrivial in unhydrogenated case; whereas for hydrogenated case, only four (GaBi, InBi, TlBi, and TlSb) remains nontrivial. The band gap is

found to be as large as 855 meV for the hydrogenated TlBi film, making this class of III-V materials suitable for room temperature applications. TlBi remains topologically nontrivial with a large band gap at various hydrogen coverages, indicating the robustness of its band topology against bonding effects of substrates.

Full text available upon request to the author

Article title: Predicted Growth of Two-Dimensional Topological Insulator Thin Films of III-V Compounds on Si(111) Substrate

Authors: Liang-Zi Yao, Christian P. Crisostomo, Chun-Chen Yeh, Shu-Ming Lai, Zhi-Quan Huang, Chia-Hsiu Hsu, Feng-Chuan Chuang, Hsin Lin & Arun Bansil

Publication title: Scientific reports 5, 2015

Abstract:

We have carried out systematic first-principles electronic structure computations of growth of ultrathin films of compounds of group III (B, Al, In, Ga and Tl) with group V (N, P, As, Sb and Bi) elements on Si(111) substrate, including effects of hydrogenation. Two bilayers (BLs) of AlBi, InBi, GaBi, TlAs and TlSb are found to support a topological phase over a wide range of strains, in addition to BBi, TiN and TlBi which can be driven into the nontrivial phase via strain. A large band gap of 134 meV is identified in hydrogenated 2 BL film of InBi. One and two BL films of GaBi and 2 BL films of InBi and TlAs on Si(111) surface possess nontrivial phases with a band gap as large as 121 meV in the case of 2 BL film of GaBi. Persistence of the nontrivial phase upon hydrogenations in the III-V thin films suggests that these films are suitable for growing on various substrates.

Full text link <https://tinyurl.com/48dk2fyy>

Oral Presentations:

Article title: Prediction of Quantum Anomalous Hall Insulator in Transition Metal-Doped GaBi Honeycombs.

Authors: J.-R. Su, C.P. Crisostomo, Z.-Q. Huang, C.-H. Hsu, H. Lin, and F.-C. Chuang.

Meeting title: Physical Society of Taiwan Annual Meeting, January 2018

Article title: Chemically-induced Large-Gap Quantum Anomalous Hall Insulator States in III-Bi Honeycombs.

Authors: C.P. Crisostomo, F.-C. Chuang, Z.-Q. Huang, C.-H. Hsu, H. Lin, and A. Bansil.

Meeting title: American Physical Society March Meeting 2017, New Orleans, Louisiana, USA, March 2017.

Article title: Quantum Anomalous Hall Insulator in Asymmetrically Functionalized Germanene.

Authors: C.-H. Hsu, Z.-Q. Huang, C.P. Crisostomo, Y.-M. Gu, Y. Fang, S. Wu, Z.-Z. Zhu, L. Huang, F.-C. Chuang, H. Lin, A. Bansil.

Meeting title: American Physical Society March Meeting 2017, New Orleans, Louisiana, USA, March 2017.

Article title: Chemically-induced Large-Gap Quantum Anomalous Hall Insulator States in III-Bi Honeycombs.

Authors: C.P. Crisostomo, F.-C. Chuang, L.-Z. Yao, C.-C. Yeh, S.-M. Lai, Z.-Q. Huang, C.-H. Hsu, H. Lin, and A. Bansil.

Meeting title: Physical Society of Republic of China (Taiwan) Annual Meeting 2017, Tamkang University, Taipei, Taiwan, January 2017.

Article title: Predicted Growth of Two-Dimensional Topological Insulators Consisting of Hydrogenated III-V Thin films on Si(111) Substrate.

Authors: F.-C. Chuang, C.P. Crisostomo, L.-Z. Yao, C.-C. Yeh, S.-M. Lai, Z.-Q. Huang, C.-H. Hsu, H. Lin, and A. Bansil.

Meeting title: APS March Meeting 2016, Baltimore, Maryland, USA, March 2016.

Article title: Prediction of Quantum Anomalous Hall Insulator in Functionalized GaBi Honeycomb

Authors: C.P. Crisostomo, S.-P. Chen, Z.-Q. Huang, C.-H. Hsu, F.-C. Chuang, H. Lin, and A. Bansil

Meeting title: Physical Society of Republic of China (Taiwan) Annual Meeting 2016, National SunYat-Sen University, Kaohsiung, Taiwan, January 2016.

Article title: Prediction of Large-Gap Two-Dimensional Topological Insulators Consisting of Hydrogenated Bilayers of Group III Elements with Bi.

Authors: C.P. Crisostomo, L-Z Yao, C-H Hsu, Z-Q Huang, F-C Chuang, H Lin, M Albao, A Bansil.

Meeting title: American Physical Society March Meeting, San Antonio, Texas, USA, March 2015.

Article title: An Ising-Based Model For the Spread of Infection.

Authors: C.P. Crisostomo and CMN Piñol.

Conference title: International Conference on Mathematical Biology and Ecology, Amsterdam, The Netherlands, July 2012.

Contact details: christian.crisostomo@pcieerd.dost.gov.ph



DR. KARELL JO ANGELIQUE C. CALPITO

Re-emerging and Emerging Diseases

Dr. Calpito is one of the S&T Fellows at DOST-PCHRD. Her research interest are on health policy and epidemiology. She previously worked with the Asian-Pacific Resource and Research Centre for Women working towards sexual and reproductive health and rights for all. Furthermore, she promote and advocate for universal access to health.

Sex: Female

Education:

Master of Public Health, University of the Philippines Manila, 2019

Doctor of Medicine, Saint Louis University, 2016

Bachelor of Science in Public Health, University of the Philippines Manila, 2011

Field of Specialization:

Health Policy

Epidemiology

Re-emerging diseases

Emerging diseases

Researches:

Article title: SNPs associated with sulfonylurea resistance among Filipinos diagnosed with type 2 diabetes mellitus.

Authors: Paz-Pacheco E, Nevado JB,... Calpito, KJAC

Publication title: Journal of ASEAN Federation of Endocrine Societies

Abstract:

No abstract

Full text available upon request to the author

Article title: Variants of SLC2A10 may be Linked to Poor Response to Metformin

Authors: Elizabeth Paz-Pacheco, Jose B Nevado, Jr, Eva Maria C Cutiongco-de la Paz, Gabriel V Jasul, Jr, Aimee Yvonne Criselle L Aman, Elizabeth Laurize A Ribaya, Mark David G Francisco, Ma Luz Vicenta V Guanzon, May L Uyking-Naranjo, Ma Cecille S Añonuevo-Cruz, Maria Patricia Deanna D Maningat, Cristina V Jaring, Paulette D Nacpil-Dominguez, Aniza B Pala-Mohamad, Abigail U Canto, John Paul M Quisumbing, Annabelle Marie M Lat, Diane Carla C Bernardo, Noemie Marie M Mansibang, Karell Jo Angelique C Calpito, Vincent Sean D

Ribaya, Julius Patrick Y Ferrer, Jessica H Biwang, Jodelyn B Melegrito, Christian Deo T Deguit, Carlos Emmanuel G Panerio

Publication title: Journal of the Endocrine Society 6(8), August 2022

Abstract:

Purpose

A study among Filipinos revealed that only 15% of patients with diabetes achieved glycemic control, and poor response to metformin could be one of the possible reasons. Recent studies demonstrate how genetic variations influence response to metformin. Hence, the present study aimed to determine genetic variants associated with poor response to metformin.

Methods

Using a candidate variant approach, 195 adult Filipino participants with newly diagnosed type 2 diabetes mellitus (T2DM) were enrolled in a case-control study. Genomic DNA from blood samples were collected. Allelic and genotypic associations of variants with poor response to metformin were determined using exact statistical methods.

Results

Several polymorphisms were nominally associated with poor response to metformin (Puncorr < 0.05). The most notable is the association of multiple variants in the SLC2A10 gene—rs2425911, rs3092412, and rs2425904—with common additive genetic mode of inheritance. Other variants that have possible associations with poor drug response include rs340874 (PROX-AS1), rs815815 (CALM2), rs1333049 (CDKN2B-AS1), rs2010963 (VEGFA), rs1535435 and rs9494266 (AHI1), rs11128347 (PDZRN3), rs1805081 (NPC1), and rs13266634 (SLC30A8).

Conclusion

In Filipinos, a trend for the association for several variants was noted, with further observation that several mechanisms may be involved. The results may serve as pilot data for further validation of candidate variants for T2DM pharmacotherapy.

Full text available upon request to the author

Article title: Monitoring Progress on Gender Equality using the Sustainable Development Agenda.

Authors: Khanna A, Calpito KJAC and Shrivastava G.

Publication title: Oxford Handbook of Civil Society Organizations and SDGs

Abstract:

No abstract

Full text available upon request to the author

Article title: Abortion and Stigma: Cross-country evidence from five countries in Asia.

Authors: Shrivastava G, Calpito KJAC and Khanna A.

Publication title: Sexual and Reproductive Health Matters Journal

Abstract:

No abstract

Full text available upon request to the author

Article title: Selected Sociodemographic and Psychosocial Variables Related to Childbirth Setting in a Barangay in Rosario, Cavite.

Authors: Karell Jo Angelique C. Calpito, Charmaine M. Cañizares, Venice Ann Kaye R. Celis, Nover Edward P. Duarte, Ma. Alea Razelle S. Gaela, John Robert C. Medina, Jonathan P. Guevarra, Ernesto R. Gregorio, Jr

Publication title: Acta Medica Philippina 49(3): 2015

Abstract:

No abstract

Full text available upon request to the author

Contact details: kccalpito@pchr.dost.gov.ph

**ENGR. GLEN D. ESPEÑA***Machine Design*

Engr. Espeña is one of the S&T Fellows and a former Senior Science Research Specialist in DOST MIRDC under its prototyping division. He was the project leader of Development of a Prototype Audit Pressure Controlled Ventilator using Osteovent Technology"

Sex: Male

Education:

Master of Mechanical Engineering, University of the Philippines, 2014

Bachelor of Science in Mechanical Engineering, University of the Philippines, 2009

Field of Specialization:

Food Processing and Engineering

Researches:

Article title: Design and Development of a Semi-Permanent Coupler of a Five-Coach Train

Authors: Glen D. Espeña, Geoffrey L. Abulencia, Rodnel O. Tamayo, Jonathan Q. Puerto, Pablo Q. Acuin, Jayson P. Rogelio

Publication title: 2019 IEEE 11th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM)

Abstract:

This study presents a locally designed and developed semi-permanent coupler for the DOST-MIRDC's train consisting of five 12-meter-length coaches. Using the Computer-Aided Design (CAD) software, the capability of the coupler for tension and compressive loads were considered. The calculation for the compression load of 1000 kN was required to pull the train in case of emergency towing. The CAD-modeled coupler was then simulated and analyzed using Solidworks software. The simulation was focused only on the collapsible elements for the compression load and the flange, rods, and nuts for the tension load. Using a 2000-kN Test of Metallic Products at MIRDC, the proof load test and breaking load test of 500 kN and 925.61 kN were respectively attained. The result of the tension load testing shows that the designed and fabricated semi permanent coupler is capable of withstanding load of 100 kN with a significant tolerance.

Full text available upon request to the author

Article title: Modeling of Ejector Refrigeration System and Its Application to the Design of an Ejector Cooler for a Hot-Spring Resort in the Philippines

Authors: Menandro S. Berana and Glen D. Espeña

Publication title: The World Congress on Engineering 2016

Abstract:

No abstract

Full text available upon request to the author

Article title: Ejector Modeling for Heat-Driven Ejector Refrigeration System

Authors: Glen D. Espeña, Menandro S. Berana

Publication title: 8th International Conference on Multiphase Flow

Abstract:

No abstract

Full text available upon request to the author

Article title: Mathematical Model of Irreversible Nozzle Condition of Heat-Driven Ejector Refrigeration System

Authors: Mark Anthony B. Redo, Glen D. Espeña, Menandro S. Berana

Publication title: 8th International Conference on Multiphase Flow

Abstract:

No abstract

Full text available upon request to the author

Contact details: glen.espena@gmail.com

**DR. FIDES ANGELI D. ZAULDA***Plant Virology*

Dr. Zaulda is one of the S&T Fellows at DOST ITDI. She is a graduate of Plant Pathology from The Ohio State University and her dissertation is on the development of virus vectors and CRISPR tools for soybean functional genetics. Dr. Zaulda is currently involved in the Establishment of the Virology and Vaccine Institute of the Philippines.

Sex: Female

Education:

Doctor of Philosophy in Plant Pathology, The Ohio State University, USA, 2021

Master of Science in Plant Pathology, The Ohio State University, USA, 2021

Master of Science in Molecular Biology and Biotechnology, University of the Philippines, 2015

Bachelor of Science in Molecular Biology and Biotechnology, University of the Philippines, 2010

Field of Specialization:

Plant virology

Biotechnology

Genome editing for crop improvement

Molecular Biology

Researches:

Article title: Immunodiagnosis of bunchy top viruses in abaca with polyclonal antibodies against their recombinant coat proteins

Authors: Koh, Rhosener Bhea L. Zaulda, Fides Angeli D. L. C. Barbosa, Cris Francis C. Aquino, Vermando M.; et al.

Publication title: Archives of Phytopathology and Plant Protection 53: 82-98, 2020

Abstract:

Polyclonal antibodies against abaca bunchy top virus (ABTV) and banana bunchy top virus (BBTV) proteins are necessary for immuno-based detection of these two viruses in abaca (*Musa textilis* Nee). In this study, recombinant bunchy top viral coat proteins fused with a 6xHis tag at the N-terminus were expressed in *E. coli* BL21Star™(DE3)pLysS strain and purified under denaturing conditions. Purified recombinant ABTV and BBTV coat proteins were used as antigens for the production of rabbit polyclonal antibodies. IgG was purified and evaluated by Direct Antigen Coating (DAC)-ELISA and further optimized by testing primary to secondary antibody dilution combinations. Analysis of ABTV and BBTV-infected abaca samples using the optimized DAC-ELISA assay showed that the anti-ABTV CP IgG can react to BBTV and that

anti-BBTV CP IgG can react to ABTV, hence, a cross-reaction. The study demonstrates the advantage of using recombinant DNA technology for mass production of antigens for antibody production. Although specificity of the polyclonal antibodies may have been compromised when renatured recombinant proteins were used as immunogens, the ability of the purified IgGs to detect positive abaca samples reveals that the DAC-ELISA can be routinely used for screening disease-free abaca planting materials.

Full text available upon request to the author

Article title: Generation of a Cowpea severe mosaic virus infectious clones.

Authors: Fides Angeli Zaulda., Shaoyan Zhang, Feng Qu, Junping Han

Publication title: APS Annual Meeting, Cleveland, 2019

Abstract:

Infectious clones are important for functional studies of plant RNA viruses. Cowpea severe mosaic virus (CPSMV; Genus Comovirus, Family Comoviridae) is an RNA virus with a bipartite genome consisting of two single-stranded, plus-sense RNA segments. CPSMV is a well-known pathogen of cowpea, soybean, and other legume species. The RNA1 encodes proteins involved in replication, whereas the RNA2 encodes the movement protein and two coat proteins. In this study, we generated an infectious clone of a CPSMV variant able to infect tobacco (*Nicotiana benthamiana*) and soybean (*Glycine max*). The full-length cDNAs obtained from the CPSMV CB strain were cloned separately into the pAI101 binary vector downstream of a CaMV35S promoter with duplicated enhancers, and confirmed by restriction enzyme digestion and sequencing. Two amino acid changes were observed in the RNA1 polyprotein (S1098P and K1651R) when compared to the NCBI reference sequence (NC_003545.1), and none in the RNA2 polyprotein. The construct was introduced into lima bean cotyledons using particle bombardment. Inoculation with lima bean extracts resulted in systemic infection in both tobacco and soybean hosts. Infectivity was also retained throughout passages from soybean to tobacco. Surprisingly, *Agrobacterium* (C57C1) transformed with the construct harboring RNA1 cDNA grew into extremely small colonies on the selection plate, and did not grow at all in liquid culture without introducing mutations. Analysis of CPSMV mutants containing systematic deletions showed that the toxicity was imparted by a region in the N-terminal portion of the viral RNA-dependent RNA polymerase. This CPSMV infectious clone can be used as a plant virus vector to express foreign proteins or RNA, to study synergy between different comoviruses, and to study superinfection exclusion among bipartite viruses.

Full text available upon request to the author

Article title: Bean pod mottle virus (BPMV)-mediated expression of *Phytophthora sojae* avirulence (Avr) proteins elicits hypersensitive response in soybean cultivars with corresponding Rps genes

Authors: Zaulda, F.A., Han, J.H., Dorrance, A.D., and Qu, F.

Publication title: 2018 Annual Meeting of the American Society for Virology College Park, MD. 14-18 July 2018.

Abstract:

No available

Full text available upon request to the author

Article title: Genetic Diversity of Banana Bunchy Top Virus (BBTV) in the Philippines.

Authors: Zaulda, F.A.D., Galvez, L.C., and V.M. Aquino.

Publication title: 2015 International Congress General Meeting, Tokyo University of Agriculture, Tokyo, Japan. 07-09 November 2015.

Abstract:

No abstract

Full text available upon request to the author

Article title: Characterization and Recombinant Expression of Abaca Mosaic Virus Coat Protein and Production of Polyclonal Antiserum.

Authors: Zaulda, F.A.D., Galvez, L.C., and V.M. Aquino.

Publication title: 44th PSM Annual Convention. Marriott Hotel. 16-17 July 2015.

Abstract:

No abstract

Full text available upon request to the author

Article title: Recombinant Expression of Banana Bract Mosaic Virus (BBrMV) Coat Protein and Production of Polyclonal Antiserum.

Authors: Zaulda, F.A.D., Galvez, L.C., and V.M. Aquino.

Publication title: 44th PSM Annual Convention. Marriott Hotel. 16-17 July 2015.

Abstract:

No abstract

Full text available upon request to the author

Article title: Heterologous Expression of the Replication Initiation Protein (Rep) of Two Bunchy Top Viruses and Production of Polyclonal Antiserum.

Authors: Zaulda, F.A.D. and V.M. Aquino.

Publication title: 36th NAST Annual Scientific Meeting. Philippine International Convention Center. 09-10 July 2014.

Abstract:

No abstract

Full text available upon request to the author

Contact details: fides.zaulda@gmail.com

**DR. RAUL B. JAVIER, JR.***Human Security and Defense*

Dr. Javier is one of the S&T Fellows in DOST-FPRDI. He received his PhD in Molecular Biology and Biotechnology and MS in Biochemistry from the University of the Philippines Los Baños. He is a former Supervising Science Research Specialist in the National Research Council of the Philippines (NRCP) under the Career Incentive Program. Dr. Javier is currently involved in the Development of Emergency Bamboo Boats for Disaster Risk Reduction.

Sex: Male**Education:**

Doctor of Philosophy in Molecular Biology & Biotechnology, University of the Philippines Los Baños, 2016

Master of Science in Biochemistry, University of the Philippines Los Baños, 1997

Bachelor of Science in Chemistry, University of the Philippines Los Baños, 1991

Field of Specialization:

Biochemistry

Inorganic Chemistry

Organic Chemistry

Chemical Toxicology

Researches:

Article title: Fish Bioindicator Revealing Environmental Impact of Pollution and Some Policy Considerations.

Authors: Javier, Raul Jr. B. and Petilla, Geraldo S.

Publication title: NRCP Research Policy Digest 2020:01

Abstract:

No abstract

Full text available upon request to the author

Article title: Can mined-out areas be made green again? Some Policy Considerations.

Authors: Javier, Raul Jr. B. and Petilla, Geraldo S.

Publication title: NRCP Research Policy Digest 2019: 01-1

Abstract:

No abstract

Full text available upon request to the author

Publication title: A Compilation of Analytical Procedures for Fiber Research

Authors: Javier, Raul Jr.

Publisher: DOST PTRI, 2017

Abstract:

No abstract

Full text available upon request to the author

Publication title: Biophysical Resource Assessment of Liguasan Marsh in S.K. Pendatun, Maguindanao.

Authors: Silva, N.B., Antesa, D.A., Javier, R.B. Jr., Magale, B.A., Sulla, A.B. and R.B. Tuburan

Publisher: Maguindanaon Development Foundation, Inc. and Research Center, Notre Dame of Marbel University, Koronadal City, South Cotabato, Philippines. 25pp.

Abstract:

No abstract

Full text available upon request to the author

Article title: Astaxanthin Extraction from Shrimp Processing Waste.

Authors: Sabularse, V.C. and R.B. Javier, Jr.

Publication title: ASEAN Journal of Science and Technology Development. 12(2): 9-25, 1995

Abstract:

No abstract

Full text available upon request to the author

Contact Details: rjavieraulb@gmail.com

DR. KAREL G. PABELIÑA*Physics, Material Science*

Dr. Pabeliña is one of the S&T Fellows in DOST-TAPI. She has five years of experience in patent research and analysis; two years in new product and equipment development and introduction, and nine years in scientific research, plasma technology, and material science. Dr. Pabeliña's research interests are Experimental Plasma Physics, Surface and Interface Science, Instrumentation Physics, Materials Science, Photovoltaics, Thin Film Deposition, and glass property-improvement.

Sex: Female**Education:**

Doctor of Philosophy in Physics, University of the Philippines Diliman, 2014

Master of Science in Physics, University of the Philippines Diliman, 2010

Bachelor of Science in Applied Physics (Instrumentation), University of the Philippines Diliman, 2007

Field of Specialization:

Experimental Plasma Physics

Surface and Interface Science

Instrumentation Physics

Materials Science

Thin Film Deposition

Photovoltaics

Glass Property-Improvement

Researches:

Article title: Wettability of Plasma-treated fibers of Anahaw (*Livistona rotundifolia*), Buri (*Corypha elata*) and Pandan (*Pandanus amaryllifolius*)

Authors: Karel G. Pabeliña, Joseph P. Hortezuella, Ruth Mary P. Fallesgon, Henry J. Ramos

Publication title: Advanced Materials Research 894: 154-157, 2014

Abstract:

Anahaw (*Livistona rotundifolia*), Buri (*Corypha elata*) and Pandan (*Pandanus amaryllifolius*) leaves were plasma-treated using argon, oxygen and carbon tetrafluoride (CF₄) gas under varying discharge currents (5 mA, 10 mA, 20 mA and 30 mA) for 15 minutes. The wettability properties of the plasma-treated samples were investigated using the sessile drop method to determine static contact angles on the surfaces. Based on the results, it was observed that increasing the discharge current in argon and oxygen plasma treatment was found to increase

the wettability of the three samples while it decreased the wettability of Pandan and Buri samples for carbon tetrafluoride plasma.

Full text available upon request to the author

Article title: Effects of dielectric barrier discharge plasma modification on surface properties of tropical hardwoods at low pressure

Authors: MN Acda, EE Devera, RJ Cabangon, KG Pabelina & HJ Ramos

Publication title: Journal of Tropical Forest Science 24(3): 416–425, 2012

Abstract:

The study investigated the use of dielectric barrier discharge (DBD) for surface modification of *Shorea contorta* (white lauan), *Gmelina arborea* (yemane) and *Acacia mangium*. Wood specimens were exposed to oxygen plasma at various intensities ranging from 5.8 to 46.5 kW-min m⁻². Surface free energy was calculated based on contact angle measurements to determine thermodynamic changes on plasma modified wood. Surface characteristics were evaluated using attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy and atomic force microscopy (AFM). Results of the study showed that plasma modification resulted in significant increase in surface free energy of the three wood species investigated. ATR-FTIR indicated that plasma-treated wood had higher surface polarity compared with untreated controls. AFM 3D image showed that oxygen plasma was capable of cleaning and etching wood surface resulting in the degradation of primary and secondary cell walls.

Full text link <https://tinyurl.com/mrxrkht>

Article title: Plasma impregnation of wood with fire retardants

Authors: Karel G. Pabeliña, Carmencita O. Lumban, Henry J. Ramos

Publication title: Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 272: 365-369, 2012

Abstract:

The efficacy of chemical and plasma treatments with phosphate and boric compounds, and nitrogen as flame retardants on wood are compared in this study. The chemical treatment involved the conventional method of spraying the solution over the wood surface at atmospheric condition and chemical vapor deposition in a vacuum chamber. The plasma treatment utilized a dielectric barrier discharge ionizing and decomposing the flame retardants into innocuous simple compounds. Wood samples are immersed in either phosphoric acid, boric acid, hydrogen or nitrogen plasmas or a plasma admixture of two or three compounds at various concentrations and impregnated by the ionized chemical reactants. Chemical changes on the wood samples were analyzed by Fourier transform infrared spectroscopy (FTIR) while the thermal changes through thermo gravimetric analysis (TGA). Plasma-treated samples exhibit superior thermal stability and fire retardant properties in terms of highest onset

temperature, temperature of maximum pyrolysis, highest residual char percentage and comparably low total percentage weight loss.

Full text available upon request to the author

Article title: Comparative Study on the Use of Different Metal Electrodes in Low-Pressure Glow Discharge Plasma Sterilization

Authors: Joanna Abigael Daseco, Karel G. Pabelina, Ma. Auxilia T. Siringan, Henry J. Ramos

Publication title: Plasma Medicine

Abstract:

The sterilizing efficacy of low-pressure direct current glow discharge hydrogen peroxide (H₂O₂) plasma generated by a planar parallel plate plasma source using the plasma enhanced chemical vapor deposition (PECVD) facility was tested. This study compares the effect of using different metals (copper, stainless steel, and aluminum) as electrodes in plasma sterilization of stainless steel dishes. Test samples were exposed to H₂O₂ plasma under different sets of discharge currents and exposure times. *Bacillus subtilis* was used as the test organism and microbial analysis was made by means of the standard plate count method of serial dilution and pour plating. Evaluation of microbial death was done using survival curves, percent reduction, and decimal reduction value. Results showed that sterilization using copper electrodes exhibited the highest decimal reduction value (D-value) and percent reduction among the three electrodes. However, statistical analysis using multivariate analysis of variance (MANOVA) at 0.05 significance level assessed that the type of electrode material is not a significant factor in the H₂O₂ plasma sterilization of *Bacillus subtilis* cells.

Full text link available upon request to the author

Papers Presented:

Article title: Review of plasma treatments of tropical hardwood in vacuum and atmospheric pressure

Authors: L.M.D. Rosario, R.D. Manalo, K.G. Pabeliña, J.R.Y. Uy, H.J. Ramos, and R.B. Tumlos

Publication title: Proceedings of the 1st International Symposium of the Vacuum Society of the Philippines, Ateneo de Manila University, January 14-15, 2016.

Article title: Fast low-energy plasma processing of a tropical hardwood for enhanced surface properties

Authors: L.M.D. Rosario, R.D. Manalo, J.R.Y. Uy, K.G. Pabeliña, H.J. Ramos, and R.B. Tumlos

Publication title: Proceedings of the 36th International Symposium on Dry Process, Yokohama, Japan, 27-28 November 2014

Article title: Enhanced surface energy of a tropical hardwood using a cold atmospheric plasma

Authors: L.M.D. Rosario, R.D. Manalo, J.R.Y. Uy, K.G. Pabeliña, H.J. Ramos, and R.B. Tumlos

Publication title: Proceedings of the 31th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol.11, National Institute of Physics, October 17-20, 2014

Article title: Development of ECR Microwave Antenna for the production of streaming atmospheric-pressure plasma

Authors: C.F.P. Romero, M. Wada, K.G. Pabelina, L.M.D. Rosario, M.C.C. Lacdan, H.V. Lee, Jr., J.A.S. Ting, H.J. Ramos, M.A.T. Siringan, and R.B. Tumlos,

Publication title: Proceedings of the 5th International Conference on Plasma Medicine, Narra, Japan, 18-23 May 2014.

Article title: Effect of oxygen plasma treatment on the UV absorbance of electrospun polylactic acid-cellulose acetate fiber mats

Authors: J.A. Daseco, K. Pabeliña, J. Monserate, and H.J. Ramos

Publication title: Proceedings of the 31th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol.10, University of San Carlos, Cebu City, October 23-25, 2013

Article title: Sterilization using atmospheric and dielectric barrier discharge plasmas

Authors: H. Ramos, C.F. Romero, J.K. Soriano, J.A. Daseco, K. Pabeliña, L.M. Rosario, R. Tumlos, and M.A. Siringan

Publication title: Proceedings of NSRI@30, UP Diliman, 25-27 March 2013

Article title: Hydrophilic and hydrophobic glass by direct current glow discharge low pressure plasma treatment

Authors: J.A. Daseco, K. Pabeliña, H. Ramos, A. Somintac

Publication title: Proceedings of the 30th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol.9, De La Salle Health Sciences Institute, Dasmarinas City, Cavite, Philippines October 22-24, 2012

Article title: Bacterial inactivation using atmospheric-pressure plasma jet

Authors: C.F.P. Romero, K.G. Pabeliña, L.M.D. Rosario, M.C.C. Lacdan, H.V. Lee, Jr., J.A.S. Ting, H.J. Ramos, M.A.T. Siringan, and R.B. Tumlos

Publication title: Proceedings of the 11th Asia Pacific Conference on Plasma Science and Technology (APCPST), Kyoto, Japan, 2-5 October 2012.

Article title: Analysis of Glow Discharge Argon and Oxygen Plasma-Treated Philippine Coconut Fibers

Authors: J.R.Guhit, K.G. Pabeliña, R.B. Tumlos, H.J. Ramos

Publication title: Proceedings of the 11th Asia Pacific Conference on Plasma Science and Technology (APCPST), Kyoto, Japan, 2-5 October 2012.

Article title: Wettability and Bacterial Retention property of plasma Treated polyethylene terephthalate

Authors: K.G. Pabelina, C.P. Romero, J.Y. Daseco, H.J. Ramos

Publication title: Proceedings of the 21st International Toki Conference (ITC21): Integration of Fusion Science and Technology for Steady State Operation, Ceratopia, Toki, Gifu, Japan, November 28 - December 1, 2011.

Article title: Effects of Argon and Water Plasma Treatments on Philippine Coconut Fibers

Authors: J.R.M. Guhit, K.G. Pabelina, H.J. Ramos

Publication title: Proceedings of the 21st International Toki Conference (ITC21): Integration of Fusion Science and Technology for Steady State Operation, Ceratopia, Toki, Gifu, Japan, November 28 - December 1, 2011.

Article title: Optical emission spectroscopy studies on the efficacy of nitrogen addition to boric acid plasma as flame retardant on wood

Authors: K. Pabeliña, J. Guhit, C. Romero, J. Daseco, J. de Vero, and H. Ramos

Publication title: Proceedings of the 28th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol.7, Meralco Management and Leadership Development Center, Antipolo City, October 25-27, 2010.

Article title: Effects of chemical and plasma treatment on the flame retardance of plywood

Authors: C. Lumban, K. Pabeliña, and H. Ramos

Publication title: Proceedings of the 28th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol.7, Meralco Management and Leadership Development Center, Antipolo City, October 25-27, 2010.

Article title: Optimization of magnetron sputtering in a magnetized sheet plasma for the deposition of multilayered Ti/TiN films

Authors: L.M.D. Rosario, K.G. Pabeliña, R.P.B. Viloan, R.B. Tumlos, H.J. Ramos

Publication title: Proceedings of the 11th Asia Pacific Physics Conference, Shanghai Everbright Convention and Exhibition Center International Hotel, Shanghai, China, November 14-18, 2010.

Article title: Optical emission spectroscopy studies on the efficacy of nitrogen addition to boric acid as flame retardant on wood

Authors: K. Pabeliña, J. R. Guhit, C. F. Romero, J. A. Daseco and H. J. Ramos

Publication title: Proceedings of the 11th Asia Pacific Physics Conference, Shanghai Everbright Convention and Exhibition Center International Hotel, Shanghai, China, November 14-18, 2010.

Article title: Thermal degradation characteristics of flame-retarded wood

Authors: K. Pabeliña, C. Lumban, and H. Ramos

Publication title: Proceedings of the 3rd ASEAN-India Thermal Spray Project Cum Scientific Forum, Hotel Dominique, Tagaytay City, Philippines October 18-20, 2010

Article title: Plasma Impregnation of Wood with Fire Retardants

Authors: K. Pabeliña, C. Lumban and H. Ramos

Publication title: Proceedings of the 17th International Conference on Ion Beam Modification of Materials (IBMM), Marché Bonsecours, Vieux Montréal (Québec), Canada, August 22-27, 2010.

Article title: FTIR analysis of phosphoric acid plasma-treated plywood

Authors: C. Lumban, K. Pabeliña, G. Blantocas and H. Ramos

Publication title: Proceedings of the 27th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol. 6, DAP, Tagaytay City, Oct. 28-30, 2009.

Article title: Antimicrobial properties of titanium copper nitride produced by a magnetized sheet plasma source

Authors: K. Pabeliña, M. Villamayor, M. Siringan, H. Ramos

Publication title: Proceedings of the 26th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol. 5, University of the Philippines, Baguio City, Oct. 22-24, 2008.

Article title: Surface modification of ophthalmic CR-39 polymer lenses by low energy hydrogen ion shower (LEHIS) treatment

Authors: A. A. Lim, K. Pabeliña, G. Blantocas, H. Ramos

Publication title: Proceedings of the 26th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol. 5, University of the Philippines, Baguio City, Oct. 22-24, 2008.

Article title: "Sterilization of a packaged material using low pressure glow discharge plasma",

Authors: K. Pabeliña, M. A. T. Siringan, and H. J. Ramos

Publication title: Proceedings of the 25th Samahang Pisika ng Pilipinas Physics Congress, ISSN 1656-2666 Vol. 4, University of the Philippines, Los Baños, Laguna, October 24-26, 2007.

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EDMARK C. KAMANTIGUE*Plant Chemistry*

Mr. Kamantigue is one of the S&T Fellows in DOST-FPRDI. He is currently taking his Doctorate degree in Biochemistry from the University of the Philippines Manila. His research interests are Plant Chemistry and Pharmaceutical Biostatistics and Plant Chemistry

Sex: Male**Education:**

Doctor of Biochemistry, University of the Philippines Manila, *ongoing*

Master of Science in Pharmacy major in Pharmaceutical Chemistry, University of the Philippines Manila, 2017

Bachelor of Science in Pharmacy, Our Lady of Fatima University, 2011

Field of Specialization:

Plant Chemistry

Pharmaceutical Biostatistics and Plant Chemistry

Researches:

Article title: In vitro mammalian alpha-glucosidase inhibitor screening of selected plant materials from Siba-o, Calabanga, Camarines Sur.

Authors: Edmark C. Kamantigue, Judilynn S. Solidum, Noel S. Quiming, Marilou G. Nicolas, Switzale M. Pidlaon

Publication title: Philippine Journal Health Science and Research 21(3), 2017

Abstract:

Background and Objectives: Diabetes mellitus type 2 (DM2) remains a health threat to Filipinos. According to the International Diabetes Federation 2014, the Philippines is one of the emerging DM2 hotspots with an estimated prevalence rate of around 3.2 million cases (5.9%) between 20 to 79 years old. In line with the acceptance of Filipino patients with the utilization of herbal medicine as an effective alternative for treatment of their ailments, some of the selected plant materials from Siba-o, Calabanga, Camarines Sur were explored for mammalian intestinal alpha-glucosidase inhibition in vitro to develop new herbal drug candidates that are effective, safe, and more affordable.

Methodology: Exhaustive maceration using absolute ethanol was performed to extract the phytoconstituents from the plant matrix. In vitro alpha-glucosidase inhibition assay using

spectroscopic method (96 well plates) was carried out to analyze the mammalian α -glucosidase inhibition of the different plant samples, IC_{50} was determined from the generated linear regression extrapolated from concentrations-% inhibitions plot. Thin Layer Chromatography (TLC) bioautography was employed to identify the presence of flavonoids, tannins, essential oil, reducing sugar, coumarin, anthraquinones, anthrones, steroids, alkaloids, and peptides.

Results: From the 98 crude plant samples extracted, the ethanolic extracts of *Melothria* sp. stem with leaves showed a concentration-dependent inhibition activity towards mammalian α -glucosidase from rat intestine acetone powder with IC_{50} values of 49.24 ppm. Tannins, flavonoids, essential oils, and indoles were detected from TLC bioautography that may be responsible for the bioactivity.

Conclusions and Recommendations: The results demonstrated the potential utilization of some plant samples as an alternative herbal drug. However, only *Melothria* sp. crude leaves and stem extract (SB32LS) showed a concentration-dependent activity and further studies must be done to isolate the metabolites responsible for the activity through activity-guided isolation.

Full text available upon request to the author

Article title: Partial purification of the mammalian alpha-glucosidase inhibitor from *Melothria* sp. (Fam. Cucurbitaceae) leaves and stem extract: in vitro.

Authors: Edmark C. Kamantigue¹, Noel S. Quiming, Judylynn N. Solidum, and Marilou G. Nicolas

Publication title: JSTAR, Special Edition 2019

Abstract:

Diabetes Mellitus Type 2 (DM2) is a chronic disease characterized by insufficient insulin levels, pancreatic beta cells function loss and insulin resistance in peripheral tissue. Voglibose and acarbose are the clinically used alpha-glucosidase inhibitor; however, adverse effects such as nausea, diarrhea, and bloating hinder the utilization of these agents. Hence, there is a need to explore for an alternative drug that has fewer side effects, better activity, and more affordable than the current commercial drugs. In this study, *Melothria* sp. was purified using normal phase column chromatography. Seven fractions (fraction A-G) were separated and tested for mammalian alpha-glucosidase assay in vitro and phytochemical screening was conducted to determine the metabolites present in each fraction. Fraction F showed a promising activity against the enzyme and comparable to other natural products and commercial alphasglucosidase agent, acarbose. Phenolic compounds such as tannins and flavonoids based on the phytochemical screening were detected present in the sample which can be responsible in the inhibition activity of the semi-purified extracts.

Full text available upon request to the author

Article title: In Silico screening of selected Natural Product Compounds against Human Neutrophil Elastase.

Authors: Johnalyn C. Go and Edmark C. Kamantigue

Publication title: JSTAR, Special Edition, 2019

Abstract:

Human neutrophil elastase (HNE) is one of the key proteases present in the neutrophil and is involved in the pathogenesis of different inflammatory disorders. In recent years, the investigation for potential HNE inhibitors are increasing and one of the strategies in drug discovery is the use of in silico drug screening of the reported isolated compounds from natural products. In this study, the docking behavior of HNE with a series of compounds isolated from herbs that inhibit lung inflammation was investigated. iGEMDOCK v.2.1. (Graphical Environment for Recognizing Pharmacological Interactions and Virtual Screening) was used for the docking, virtual screening, and post-screening analysis of pharmacological interactions between the enzyme HNE and various lead compounds as the ligand. And based on the results, Compound 22 ([2R,3R, 4S, 6S]-3,4,5-trihydroxy-6-[(2R)-5-hydroxy-2-(4-hydroxyphenyl)-4-oxo-2,3-dihydro-1-benzopyran-7-yl]oxy)oxan-2-yl]methyl(2E)-3-4-hydroxyphenyl)prop-2-enoate has the highest inhibition potential according to the calculated Gibbs free energy. The finding of this study is the first to be reported based on the current knowledge of the authors. It is recommended that further analysis of the test compound must be performed both in vitro and in vivo to validate its bioactivity.

Full text available upon request to the author

Article title: Perception on, Propagation and Usage of Medicinal Plants Among Selected Barangays in Sampaloc, Manila, Philippines.

Authors: Edmark Kamantigue, Angelica Balais-Rin, Marilen Pacis, and Fritz Gerald V. Jabonete

Publication title: Journal of Sciences, Arts, and Technology Research. Vol 6, Sept 2020

Abstract:

Medicinal plants are widely used in the Philippines particularly in rural areas as an alternative to synthetic drugs. However, there have been limited studies about the usage of medicinal plants in urban areas. The aim was to determine the perception of, propagation, and usage of medicinal plants in two partner barangays in Sampaloc, Manila. A convenience sampling was utilized in the study. The researchers utilized a questionnaire to survey (available in English and Filipino language) on the awareness and knowledge about the utilization, preparation, cultivation, and propagation of medicinal plants of the respondents. A group semi-structured interview was utilized to validate the answers of the respondents. This was done in two partner barangays in Sampaloc, Manila. The data were analyzed using the Informant consensus factor (ICF), Use value (UV), and Relative frequency citation (RFC). The data collection was conducted from October to November 2019. Both partner barangays perceived that the synthetic agent is still their primary option in treating their ailments due to established safety and efficacy. Furthermore, the partner barangays were not equipped with the basic knowledge in the proper usage of herbal plants in the community herbal garden, and herbal plants were used as

adjuvant or supportive treatment. This study showed that both adopted barangays utilized medicinal plants as an adjuvant in their synthetic medication due to its claimed safety and medicinal plants. The most propagated and cultivated medicinal plant is oregano used as a treatment for asthma and cough was the well-known plant while banaba, sabila, gugo, and tanglad were the least. It is recommended that information dissemination campaigns especially on the DOH-approved medicinal plants be strengthened and heightened to increase participation from the barangay counterparts.

Full text available upon request to the author

Article title: Chemical Derivatization-based UV-Vis Spectrometry Analysis of Aminophenol Metabolites in a Biological Matrix.

Authors: Go, J., Kamantigue, E., and Orejola, J.J.

Publication title: Journal of Sciences, Arts, and Technology Research 2022

Abstract:

No abstract

Full text available upon request to the author

Article title: Direct TLC-Bioautography guided fractionation of free radical scavenging activity of *Barringtonia racemosa* L. (Fam:Lecythidaceae) leaf non-polar fraction.

Authors: Kamantigue, E., Quiming, N, Solidum, J., and Nicolas, M.

Publication title: Journal of Sciences, Arts, and Technology Research. 2022

Abstract:

No abstract

Full text available upon request to the author

Papers Presented:

Article title: In silico screening of potential anti-aging agent through CYP2D6 inhibition of selected isolated natural products.

Authors: Kamantigue, E.

Conference title: 2nd Faculty Research Colloquium, Multipurpose Hall, Annex Building, National U, Manila, Sept. 23, 2019

Article title: In Vitro Porcine Pancreatic Alpha-Amylase Inhibition of Crude Extract and In Silico Study of Selected Compounds Isolated from *Lagestoemia speciosa* (Lythraceae) leaves

Authors: Kamantigue, E. et al

Conference title: IUBMB Education Conference 2019 and 46th PSBMB Annual Convention, Manila Hotel, Manila City, Philippines.

Article title: Mammalian alpha-glucosidase inhibition activity of non-tannin fraction of (Meloethria ap. Fam. Cucuritaceae) leaves and stem extract"

Authors: Kamantigue, E., Quiming, N, Solidum, J., and Nicolas, M.

Conference title: IUBMB Education Conference 2019 and 46th PSBMB Annual Convention, Manila Hotel, Manila City, Philippines.

Article title: In Silico Screening of Compounds with Insect Acetylcholinesterase Inhibitory Activity

Authors: Pangilinan, C.J., Go, J., and Kamantigue, E.

Conference title: IUBMB Education Conference 2019 and 46th PSBMB Annual Convention, Manila Hotel, Manila City, Philippines.

Contact details: eckamantigue@up.edu.ph

**MA. NEDA A. CATALMA***Plant Chemistry*

Dr. Catalma is one of the S&T Fellows in DOST-PCHRD. She received her PhD in Molecular Biology and Biotechnology at UPLB, wherein her dissertation is on the DNA barcoding of economically important Philippine sea cucumbers (Holothuroidea).

Sex: Female

Education:

Doctor of Philosophy in Molecular Biology and Biotechnology, University of the Philippines Los Baños, 2015

Master of Science in Aquaculture, Central Luzon State University, 2001

Bachelor of Science in Inland Fisheries, University of the Philippines Visayas, 1992

Field of Specialization:

DNA/RNA Extraction

DNA barcoding and DNA mini-barcoding

Phylogenetics

Primer designing

Gene Cloning

Whole cell vaccine production

Bioinformatics

Fisheries

Aquaculture

Animal Breeding

Sericulture Biotechnology

Bioentrepreneurship

Researches:

Article title: Genotype Effects on C-carotene Conversion to Vitamin A: Implications on Reducing Vitamin A Deficiency in the Philippines

Authors: Zumaraga MPP, Arquiza JMRA, Concepcion MA, Perlas L, Alcudia-Catalma MNA, Rodriguez M.

Publication title: Food and nutrition bulletin 43(1):25-34, March 2022

Abstract:

Background: The study aimed to identify 2 beta-carotene 15,15'-monooxygenase (BCMO1) mutations, namely R267S and A379V, and determine their association with vitamin A status among Filipinos 6 to 19 years old respondents of the 2013 Philippine National Nutrition Survey living in the National Capital Region.

Materials and methods: This study followed cross-sectional design. Whole blood specimen was collected in the morning and was used as source of genomic DNA and serum for retinol concentration determination. Fisher exact test was performed to determine whether genotype frequencies were associated to retinol concentrations/vitamin A deficiency status. A level of $P < .05$ was identified as significant.

Results: A total of 693 Filipino children and adolescents were included. Of the 693, there were at least 7.6% who bear the combined mutations for R267S + A379V. Association analysis showed that an inverse relationship exists between the A379V TT variant and vitamin A status, although the exact role of these identified polymorphisms on retinol/carotenoid metabolism need to be confirmed in dedicated functional studies.

Conclusion: This study has identified for the first time the presence of 2 nonsynonymous genetic variants/mutations in the coding region of BCMO1 gene. Interestingly, one of these 2 variants, the A379V T, was found to be associated with vitamin A status. It is, therefore, warranted to investigate the role of BCMO1 variants for the success of supplementation programs and fortification efforts among vulnerable populations in this region. Genetic variability should be considered for future provitamin A supplementation recommendations among children and adolescents in the Philippines.

Full text link available upon request to the author

Article title: First Report on the Characterization of Genetic Diversity of Philippine -reared Bombyx mori Strains Based on COI and ITS2.

Authors: Alcudia-Catalma MN, Conde MYED, Dee Tan IY, Bautista MAM.

Publication title: Philippine Journal of Science, Special Issue on Biodiversity 150(S1):503-507, 2020

Abstract:

The mulberry silkworm, Bombyx mori, is known to produce silk and was introduced to the Philippines from China, Japan, Korea, and India. The silkworm germplasm in the Philippines is sourced from three centers located in regions that vary in climatic conditions: Philippine Textile Research Institute–Technology Center Misamis Oriental (PTRI-TCMO); Department of Science and Technology– Cordillera Administrative Region (CAR) in La Trinidad, Benguet; and the Don Mariano Marcos Memorial State University–Sericulture Research and Development Institute (DMMMSU-SRDI), La Union. To date, associated information with the centers' germplasm constitutes differences in biological and productive traits such as yield and quality of raw silk. It lacks genetic information on strain diversity, which provide basis for the efficient selection of

parental strains with traits of economic interest. This study aimed to characterize, for the first time, the genetic diversity of 17 pure lines as parental strains. Genetic variation was evaluated using the cytochrome c oxidase 1 (COI) gene and internal transcribed spacer 2 (ITS2). BLAST analysis of the COI and ITS2 sequences confirmed the identity of *B. mori* strains. Phylogenetic trees constructed from COI sequences formed a monophyletic clade, while the trees based on ITS2

sequences formed two distinct clusters. The pairwise distances based on the Kimura 2-parameter

(K2P) model between the *B. mori* strains ranged from 0–0.003 for COI and from 0–0.002 for ITS2, indicating low genetic variation for the corresponding molecular markers. Variation in the COI gene determined four nucleotide changes while variations in the ITS2 sequences determined four to six nucleotide changes, except for one strain with higher nucleotide change. This study reports that the use of COI and ITS2 as markers was not able to genotypically differentiate the 17 strains, which appear different in terms of phenotypic characters, suggesting the use of other molecular markers to characterize not only the 17 strains but all other strains in the germplasm.

Full text link <https://tinyurl.com/yckrscm>

Article title: DNA Barcoding of Economically Important Philippine Sea Cucumbers (Holothuroidea)

Authors: Ma. Neda Alcudia-Catalma, Maria Genaleen Q. Diaz, Roberta N. Garcia, Pablo P. Ocampo, Antonio C. Laurena, and Evelyn Mae Tecson-Mendoza

Publication title: Philippine Journal of Science 149: 309-320

Abstract:

This study established the DNA barcodes of 19 economically important Philippine sea cucumbers belonging to Class Holothuroidea under Phylum Echinodermata using the cytochrome c oxidase I (COI) gene. These include sea cucumbers from the Family Holothuriidae under Order Aspidochirotida: *Bohadschia marmorata*, *B. koellikeri*, *B. vitiensis*, *B. argus*, *Bohadschia* sp. 1, *Actinopyga echinites*, *A. lecanora*, *Holothuria scabra*, *H. fuscogilva*, *H. atra*, *H. impatiens*, and *H. albiventer*; from the Family Stichopodiidae under Order Aspidochirotida: *Stichopus horrens*, *S. monotuberculatus*, *S. vastus*, *S. hermanni*, *S. chloronotus*, and *Thelenota ananas*; and from the Family Phyllophoriidae under Order Dendochirotida was *Neocucumis proteus*. Based on Kimura-2 pairwise (K2P) distances, low genetic variation within species of 0.005–0.018 was observed except for several species such as *S. chloronotus*, *H. albiventer*, *A. echinites*, and *H. scabra* – which had 0.057, 0.181, 0.207, and 0.215 within-species genetic variations, respectively. On the other hand, variation between species within a genus was 0.123 for *Bohadschia*, 0.18 for *Actinopyga*, 0.19 for *Holothuria*, and 0.071 for *Stichopus*. Phylogenetic tree using neighbor-joining analysis showed monophyletic clades for the genera *Bohadschia*, *Actinopyga*, *Stichopus*, *Thelenota*, and *Neocucumis* while paraphyletic clade was formed for the genus *Holothuria*. COI DNA sequences and barcodes were established for the first time for *Neocucumis proteus* and *Holothuria albiventer*.

Full text link <https://tinyurl.com/2p8v2488>

Article title: Bioaccumulation and Health Risks Assessment of Lead (Pb) in Freshwater Asian Clams (*Corbicula fluminea* Muller) from Laguna de Bay, Philippines.

Authors: Christian Paul P. De La Cruz, Nestor M. De Vera, Lustina P. Lapie, Ma. Neda A. Catalma, and Rosalina V. Bunal

Publication title: Pollution Research. 3:2:366-372, 2017

Abstract:

The bioaccumulation of Pb and associated human health risks were investigated in the freshwater Asian clams (*Corbicula fluminea*) harvested from different coastal areas of Laguna de Bay, Philippines. Pb concentrations (mg kg⁻¹) in pooled clam soft tissue samples were determined through atomic absorption spectrometry. The mean [Pb] in clam samples obtained from sampling zones near the urbanized towns of Los Banos (1.04±0.06) and Calamba (0.87±0.01) were relatively higher as compared to the clam samples collected adjacent to the rural towns of Bay (0.71±0.02), Victoria (0.75±0.10), and Kalayaan (0.66±PLSMN;0.03). All estimated dietary index (EDI) of [Pb] for both average clam consumers (0.76-1.00) and heavy clam consumers (1.13-2.00) exceeded the permissible limits for human consumption set by international regulatory agencies. Subsequent estimates of target hazard quotient (THQ) and target cancer risk (TR) showed higher scores for samples from Los Banos (THQ= 0.2-0.5). However, all computed THQs and TRs were within the threshold level, apparently suggesting the absence of potential non-carcinogenic and carcinogenic health effects on exposed human population. Meanwhile, the demonstration by Asian clams to efficiently accumulate Pb highlights their potential use as biological tools for monitoring of toxic heavy metal pollutants, particularly in Laguna Lake.

Full text link available upon request to the author

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**DR. JOSE PRESIPHIL B. ONTOLAN, JR***Physics*

Dr. Ontolan is one of the S&T Fellows in DOST-PNRI. He received his PhD in Physics from the Mindanao State University-Iligan Institute of Technology in 2020. His research interest are Optoelectronics, Semiconductor Device Physics, Material Characterization, Semiconductor Physics, Electrical Characterization, and Thin Film Fabrication.

Sex: Male

Education:

Doctor of Philosophy in Physics, Mindanao State University - Iligan Institute of Technology, 2020

Master of Science in Physics, Mindanao State University - Iligan Institute of Technology, 2015

Bachelor of Science in Physics, Mindanao State University - Iligan Institute of Technology, 2013

Field of Specialization:

Optoelectronics

Semiconductor Device Physics

Material Characterization

Semiconductor Physics

Electrical Characterization

Thin Film Fabrication

Researches:

Article title: Modified SILAR grown ZnO films on p-Si(100) with enhanced charge separation for UV light sensing application

Authors: Jose Presiphil B. Ontolan Jr., Junie Jhon M. Vequizo, Akira Yamakata, Reynaldo M. Vequizo

Publication title: Physica Status Solidi A: Applications and Materials Science (2021)

Abstract:

Herein, the growth of pristine ZnO nanostructures thin film on p-Si(100) by modified successive ionic layer adsorption-reduction method, revealing significant improvement in the charge collection for ultraviolet light detection, is reported. The deposited ZnO exhibits spindle-like and hexagonal structure that grows preferentially along the c-axis. Two-probe electrical measurements validate the rectifying nature of the constructed n-ZnO/p-Si(100), revealing a substantial 11.3-fold increase in photocurrent at room temperature under 375 nm irradiation at +3 V working voltage. The drastic increase in photocurrent is linked to efficient charge

separation caused by charge transfer and band bending effects, as indicated by microsecond time-resolved absorption measurements, providing useful information for device development.

Full text available upon request to the author

Article title: Effects of precursor composition used in solution precursor plasma spray on the properties of ZnO coatings for CO₂ and UV light sensing

Authors: R.T. Candidato, J.P.B. Ontolan Jr., P. Carpio, L. Pawłowski, and R.M. Vequizo

Publication title: Surface and Coatings Technology 371, 2015

Abstract:

The potential of finely-structured zinc oxide (ZnO) coatings developed via solution precursor plasma spraying (SPPS) as CO₂ gas and UV light sensor was explored in this work. The coatings were deposited on stainless steel substrates using aqueous solutions of zinc nitrate and zinc acetate as precursors. The coatings' microstructures were studied in relation to the solution precursors used. Relatively porous coatings were obtained when using acetate as starting precursor compared to the coatings from the nitrate precursor. This was attributed to the different chemical routes of ZnO formation for each precursor droplet upon contact with plasma jet. Phase analysis confirmed the formation of polycrystalline ZnO having wurtzite structure from both precursors. The sprayed ZnO coatings showed good sensitivity and recovery towards UV light. Moreover, the coatings were sensitive towards carbon dioxide (CO₂) analyte gas but did not show any good recovery which was attributed to the microstructure of the coatings. These results showed the feasibility of SPPS process for the fabrication of finely-structured ZnO coatings as sensors of CO₂ gas and UV light.

Full text available upon request to the author

Article title: Properties of in situ HCl-doped emeraldine polyaniline on n-Si(100) substrates for diode application

Authors: J.P.B. Ontolan Jr., P.A.M. Alcantara, R.M. Vequizo, M.K. Odarve, B.R.B. Sambo

Publication title: Physica Status Solidi C, 1-4 2015

Abstract:

In this study, the characteristic physicochemical and electrical properties of HCl-doped polyaniline (PAni) films grown via oxidative chemical polymerization of aniline on n-Si(100) are presented. Two exothermic processes were found for 0.2 M HCl solution during aniline polymerization while all others underwent one exothermic process only. All polyaniline films were of emeraldine salt form that exhibited connected rod-like to agglomerated grains and dendritic surface morphologies on top of wetting layer with increasing hydrochloric acid concentration. Rectifying behavior of p- PAni/n-Si(100) heterojunctions were also found indicating the formation of p-n junctions between p-PAni and n-Si(100). (© 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim)

Full text available upon request to the author

Papers Presented:

Article title: Newly Prepared Hybrid Organic/Inorganic Heterojunction with Enhanced Light Sensing Performance

Authors: J.P.B. Ontolan Jr.

Conference title: Regional Multidisciplinary Research Conference 2020

Article title: Synthesis and characterization of p-PAni/n-Si(100) composites

Authors: J.P.B. Ontolan Jr.

Conference title: 34th IIT HEP Scientific Conference, MSU-IIT, CSM Lecture Hall A, Iligan City, Philippines. March 2015

Article title: Electrical properties of p-PAni/n-Si(100) heterojunctions for diode application

Authors: J.P.B. Ontolan Jr.

Conference title: 33rd IIT HEP Scientific Conference, MSU-IIT, CSM Lecture Hall A, Iligan City, Philippines. October 2014

Article title: Characteristic of in situ HCl-doped emeraldine polyaniline on n-Si(100) substrate for rectifying diode application

Authors: J.P.B. Ontolan Jr.

Conference title: 12th MSU-IIT Annual In-House Review of Research and Development Projects, Iligan City, Philippines. August 2014

Article title: Hybrid PAni/ZnO Diodes for Ammonia Gas Sensor Application

Authors: J.P.B. Ontolan Jr.

Conference title: 32nd IIT HEP Scientific Conference, Plames Beach Resort, Naawan, Misamis Occidental, Philippines. March 2013

Article title: I-V Characteristics of p-PAni/n-ZnO Composite prepared via Chemical Bath Deposition

Authors: J.P.B. Ontolan Jr.

Conference title: 31st IIT HEP Scientific Conference, MSU-IIT, CSM Lecture Hall A, Iligan City, Philippines. October 2012

Contact details: jpbontolan@pnri.dost.gov.ph

**DR. MARIA THERESA ISLA CABARABAN***Chemical Engineering*

Dr. Cabaraban is one of the S&T Fellows in DOST-PCIEERD. She received her PhD in Environmental Resource Engineering from the State University of New York, Syracuse New York in 2013. Her research interest are waste to energy processes and technologies, environmental modelling, analysis, and assessment, environmental carrying capacity assessment, and biomass processing and utilization.

Sex: Female

Education:

Doctor of Philosophy in Environmental Resource Engineering, State University of New York, New York City, USA, 2013

Master of Science in Chemical Engineering, University of the Philippines, 1995

Bachelor of Science in Chemical Engineering, Xavier University - Ateneo de Cagayan, 1988

Bachelor of Science in Electrical Engineering, MSU-Iligan Institute of Technology, 1983

Field of Specialization:

Waste to energy processes and technologies

Environmental modeling, analysis, and assessment

Environmental carrying capacity assessment

Biomass processing and utilization

Researches:

Article title: Production of biocrude and charcoal from fast oxidative pyrolysis of cassava pulp residue using a fluidized bed reactor

Authors: MT Cabaraban, G Divinagracia, JC Padernal, VM Ramirez, L Arranguez, JM Semilla, DJM Ombiga, EJ Barcelona and K Paderanga

Publication title: Journal of Engineering and Applied Sciences Technology 2(3):1-7, 2020

Abstract:

Cassava pulp (*Manihot esculenta* Crantz) residue (CPR) is the solid waste generated from the cassava processing industry. In the bench-scale experiments, fast oxidative pyrolysis of CPR was carried out in a fluidized bed reactor, using uncondensed recycled pyrolysis gas as carrier medium to produce charcoal and biocrude. The influence of three gas recycle rates, ranging from 0.60 to 2.3 Sm³ h⁻¹, on the product yields and characteristics was investigated. Results suggest that an increase in the recycle rate will lead to an increase in biocrude yield and a decrease in the charcoal yield. The product yields of biocrude and charcoal were 15.68 ± 2.08

percent and 24.29 ± 3.31 percent, respectively. The biocrude product was mainly composed of alcohols, phenols, aldehydes, ketones, alkanes, and alkynes. The charcoal obtained has a heating value that is around 85 percent higher than that of the CPR feedstock. It has a high fixed carbon content of around 67 percent, but a low volatile matter content of only around 28 percent. At the pyrolysis temperature of around 500 °C, the uncondensed pyrolysis gas compounds consisted primarily of N₂ and C₂H₆, with small amounts of H₂, and higher hydrocarbon compounds. Results suggest the potential for generating biofuel products from the fast oxidative pyrolysis of CPR.

Full text link <https://tinyurl.com/2p8we3hk>

Article title: Generating electricity from spent activated carbon: Life cycle environmental benefits

Authors: Maria Theresa Isla-Cabaraban and Gunnar Marc Shane Cabaraban

Publication title: WSEAS Transactions on Environment and Development 12:1-8, 2016

Abstract:

Coal-fired power plants generate around one-third of the electricity used in the Philippines, and therefore play a significant role in any discussion of energy and the environment. The fuel potential of spent activated carbon can be used to generate power and potentially offset the burning of coal, while making it possible to avoid the cost of SAC disposal. By cofiring SAC with coal, currently operating power plants might have an opportunity to reduce their impact, but of as yet unknown degree and trade-offs. A life cycle assessment is presented that characterizes the environmental performance of spent activated carbon-to-electricity. The assessment covers only the operation of the power plant, and excluded such processes as SAC transportation, feed preparation, and waste disposal and recycling. Cofiring was found to reduce the environmental footprint of the average coal-fired power plant. At a rate of 10% by heat input, cofiring reduces global warming potential by 40%. NO_x, SO_x, and particulate emissions are also reduced by cofiring. Consumption of nonrenewable resources and solid waste generation were found to be less for a system that cofires SAC. However, more water than is usually needed for flue gas cleanup is likely to be employed for scrubbing the hazardous Na₂O fumes generated from the direct burning of SAC containing Na₂SO₄.

Full text link <https://tinyurl.com/2v9uwd63>

Article title: Estimation of Landfill Gas Production and the Energy Availability of Municipal Solid Wastes from Upper Dagong Dumpsite Using the Philippine Landfill Gas Model v.1

Authors: Cabaraban, Maria Theresa and Shierlyn Paclijan.

Publication title: WIT Transactions on Ecology and the Environment, WIT Press, 2015.

Abstract:

No available

Full text available upon request to the author

Article title: Modeling of Air Pollutant Removal by Dry Deposition to Urban Trees Using a WRF/CMAQ/i-Tree Eco Coupled System

Authors: Maria Theresa I. Cabaraban, Charles N. Kroll, Satoshi Hirabayashi, David J. Nowak

Publication title: Environmental Pollution 176: 123-133, May 2013

Abstract:

A distributed adaptation of i-Tree Eco was used to simulate dry deposition in an urban area. This investigation focused on the effects of varying temperature, LAI, and NO₂ concentration inputs on estimated NO₂ dry deposition to trees in Baltimore, MD. A coupled modeling system is described, wherein WRF provided temperature and LAI fields, and CMAQ provided NO₂ concentrations. A base case simulation was conducted using built-in distributed i-Tree Eco tools, and simulations using different inputs were compared against this base case. Differences in land cover classification and tree cover between the distributed i-Tree Eco and WRF resulted in changes in estimated LAI, which in turn resulted in variations in simulated NO₂ dry deposition. Estimated NO₂ removal decreased when CMAQ-derived concentration was applied to the distributed i-Tree Eco simulation. Discrepancies in temperature inputs did little to affect estimates of NO₂ removal by dry deposition to trees in Baltimore.

Full text available upon request to the author

Article title: Urban forest as a practical mitigation measure for urban aerosols

Authors: Maria Theresa Isla Cabaraban

Publication title: Kahibalo Research Journal of the XU College of Engineering, Xavier University Press, 2011.

Abstract:

Trees are efficient scavengers of airborne pollutants. Due to concerns over the deteriorating air quality, recent work examined how urban tree plantings affect air quality in an urban area. This work is motivated by the potential of trees and vegetation to scavenge gas pollutants and particulates and the ability to leverage urban and roadside greening projects in the Philippines. Literature and relevant studies that explored the effects of vegetation on pollutant concentrations, particularly aerosols, were reviewed. Some factors that influence the ability of trees to efficiently reduce particulate pollution were identified, and applicable urban forest management options were presented. A conceptual tool was also applied to Metro Manila to estimate the amount of particulate pollution that might be removed by the existing and an expanded urban tree cover. The case study shows that existing tree cover in Metro Manila of less than 1% could only remove approximately 1% of the total particulate matter, and that increasing tree cover to around 4% could lead to a particulate removal of around 8%. Further work is needed to better model and assess the interactions that take place between airborne pollutants and urban trees and vegetation.

Full text link <https://tinyurl.com/mr22bxa4>

Article title: Aerobic In-Vessel Composting versus Bioreactor Landfilling Using Life Cycle Models

Authors: Cabaraban, Maria Theresa, Milind V. Khire, and Evangeline Alocilja.

Publication title: Journal of Clean Technologies and Environmental Policy, Springer, 2008.

Abstract:

Potential environmental impacts associated with aerobic in-vessel composting and bioreactor landfilling were assessed using life cycle inventory (LCI) tool. LCI models for solid waste management (SWM) were also developed and used to compare environmental burdens of alternative SWM scenarios. Results from the LCI models showed that the estimated energy recovery from bioreactor landfilling was about 9.6 megajoules (MJ) per kilogram (kg) of waste. Air emissions from in-vessel composting contributed to a global warming potential (GWP) of 0.86 kg of CO₂-equivalent per kg of waste, compared to 1.54 kg of CO₂-equivalent from bioreactor landfill. Waterborne emissions contributing to aquatic toxicity is less coming from in-vessel composting than from bioreactor landfilling. However, emissions to air and water that contribute to human toxicity are greater for the composting option than for the landfill option. Full costs for in-vessel composting is about 6 times greater than for the landfilling alternative. Integration of individually collected commingled recyclables, yard wastes, and residual wastes with windrow composting and bioreactor landfilling produces airborne and waterborne emissions with the least environmental effects among the alternatives considered. It also yields greater energy savings due to the conversion of the landfill gas (LFG) to electrical energy than the option that diverts yard waste, food waste and soiled paper for aerobic in-vessel composting. However, this scenario costs 68% more than that where the commingled collection of wastes is integrated with in-vessel composting and conventional landfilling, owing to increased collection costs.

Full text available upon request to the author

Article title: Ethanol-Based Biodiesel from Waste Vegetable Oils

Authors: Oliveros, Mary Grace, Amiliza Baiting, Menchie Lumain, and Maria Theresa Cabaraban

Publication title: ASEAN Journal of Chemical Engineering 7(1 & 2), January 2007

Abstract:

Waste vegetable oil, mainly coming from frying residues, can be used as raw material to obtain a diesel fuel (biodiesel). Biodiesel, a nontoxic, biodegradable, diesel-like fuel, is an important energy alternative capable of decreasing environmental problems caused by the consumption of fossil fuels. The utilization of waste vegetable oils as raw material in biodiesel production was studied. Research was undertaken to establish the availability of used vegetable oil to supply a biodiesel process. It is intended that this work forms an academic study combined with an environmental and technological analysis of the merits of biodiesel as a sustainable fuel. Laboratory experimentation investigated the possibility of using waste vegetable oil from the local fast food chains, and potassium hydroxide as catalyst for the transesterification process.

The cleaned waste vegetable oil undergoes transesterification for 4 hours, after which, the biodiesel is separated from the glycerin by gravity. Washing is necessary to remove residual catalyst or soap. Overall material balance for the process gives: 1 kg Waste Vegetable oil + 0.18 kg EtOH + 0.01 kg KOH \rightarrow 0.74 kg Biodiesel + 0.44 kg Glycerin The biodiesel, in pure form (B100) and in 50% proportion (B50) with petroleum diesel, was run in an essentially unmodified Toyota 2C diesel engine. Smoke density (opacity) and CO exhaust emission both decreased with B50. However, Nox increased with B50. Fuel consumption during engine power testing is significantly greater using the biodiesel, but is also significantly reduced with B50.

Full text link <https://tinyurl.com/mr3ypbcw>

Article title: Validity of Chemical Engineering Students' Academic Achievement in the Technical and Professional Courses in Predicting Licensure Examination Performance

Authors: Maria Theresa Cabaraban

Publication title: Faculty Working Series, Xavier University Press, 2007

Abstract:

No available

Full text available upon request to the author

Article title: Solid Waste Audit for the Xavier University Main Campus

Authors: Cabaraban, Maria Theresa, Rhoda Delicana, and Ryan Li.

Publication title: XU Faculty Research Journal, Xavier University Press, 2003

Abstract:

No available

Full text available upon request to the author

Papers Presented:

Article title: Effects of emulsification variables on fuel properties of bio-oil/biodiesel emulsion

Authors: Maria Theresa I. Cabaraban, Jon Michael A. Semilla, Duane Jiovani Moriss B. Ombiga, Ersean Jae D. Barcelona and Keziah P. Paderanga.

Conference title: 81st Philippine Institute of Chemical Engineers (PChE) National Convention, Bacolod City, Philippines, 19-21 February 2020.

Article title: Biofuels from the fast pyrolysis of cassava pulp residue under a reducing atmosphere: Product yield and characterization

Authors: Maria Theresa I. Cabaraban, Georgette O. Divinagracia, Jasper Caleb L. Padernal, Lilybelle C. Arranguez, and Viviel May B. Ramirez.

Conference title: 4th Philippine Solid and Hazardous Waste Management Conference and 1st International Conference on Circular Economy –based Waste Management (PSHWM – CE-WM 2019), Tarlac City, Philippines, 10-13 December 2019.

Article title: Thermochemical conversion of cassava pulp residue (*Manihot esculenta* Crantz) to bio-oil and biocoal

Authors: Maria Theresa I. Cabaraban, Georgette O. Divinagracia, Jasper Caleb L. Padernal, Lilybelle C. Arranguz, and Viviel May B. Ramirez.

Conference title: 80th Philippine Institute of Chemical Engineers (PChE) National Convention, Mandaluyong City, Philippines, 27 February-2 March 2019.

Article title: Assessment of the Energy Efficiency of the Fast Oxidative Pyrolysis of Napier Grass in a Fluidized Bed Reactor

Authors: Maria Theresa I. Cabaraban and Gunnar Marc Shane C. Cabaraban.

Conference title: 78th Philippine Institute of Chemical Engineers (PChE) National Convention, Cagayan de Oro City, Philippines, 22-25 February 2017.

Article title: Life cycle environmental benefits of generating electricity from spent activated carbon

Authors: Maria Theresa I. Cabaraban and Gunnar Marc Shane Cabaraban.

Conference title: 77th Philippine Institute of Chemical Engineers (PChE) National Convention 2016, Malay, Aklan, Philippines, 17-20 February 2016

Article title: Fast pyrolysis of biomass

Authors: Maria Theresa I. Cabaraban

Conference title: EnerCon 2015: The 1st International Energy Conference, Muntinlupa City, Philippines, 23-24 July 2015

Article title: Estimation of Landfill Gas Production and the Energy Availability of Municipal Solid Wastes from Upper Dagong Dumpsite Using the Philippine Landfill Gas Model v.1

Authors: Maria Theresa I. Cabaraban and Shierlyn Paclijan

Conference title: Energy and Sustainability 2014: 5th International Conference on Energy and Sustainability, Putrajaya, Malaysia, 16-18 December 2014.

Article title: Effects of wind and atmospheric stability conditions on dry deposition in an urban dry deposition model

Authors: Maria Theresa I. Cabaraban and Charles Kroll

Conference title: AGU Fall Meeting 2012, San Francisco, CA, 3-7 December 2012.

Article title: Modeling of Air Pollutant Removal by Urban Trees Using a WRF/CMAQ/i-Tree Coupled System

Authors: Charles N. Kroll, Maria Theresa Isla-Cabaraban, David J. Nowak, Satoshi Hirabayashi, and Theodore Endreny

Conference title: AGU Fall Meeting 2011, San Francisco, CA, 5-9 December 2011

Article title: Evaluation of Aerobic In-Vessel Composting versus Bioreactor Landfilling Using Life-Cycle Inventory Models

Authors: Cabaraban, Maria Theresa, Milind Khire, and Evangelyn C. Alocilja

Conference title: Proceedings of the Symposium on Infrastructure Development and the Environment 2006, Manila, Philippines, 7-8 December 2006.

Article title: Evaluation of Aerobic In-Vessel Composting versus Bioreactor Landfilling Using Life-Cycle Inventory Models

Authors: Cabaraban, Maria Theresa, Milind Khire, and Evangelyn C. Alocilja

Conference title: Proceedings of the Regional Symposium on Chemical Engineering 2006, Singapore, 3-5 December 2006

Article title: Validity of Chemical Engineering Students' Academic Achievement in the Technical and Professional Courses in Predicting Licensure Examination Performance

Authors: Cabaraban, Maria Theresa

Conference title: Proceedings of the Regional Symposium on Chemical Engineering 2004, Bangkok, Thailand, 1-3 December 2004.

Article title: Ethanol-Based Biodiesel from Waste Vegetable Oils

Authors: Oliveros, Mary Grace, Amiliza Baiting, Menchie Lumain, and Maria Theresa Cabaraban

Conference title: Proceedings of the Regional Symposium on Chemical Engineering 2004, Bangkok, Thailand, 1-3 December 2004

Article title: Solid Waste Audit for the Xavier University Main Campus

Authors: Cabaraban, Maria Theresa, Rhoda Delicana, and Ryan Li

Conference title: Proceedings of the Regional Symposium on Chemical Engineering 2003, Manila, Philippines, 1-3 December 2003

Article title: High-Solids Anaerobic Digestion Using Kitchen and Yard Wastes as Substrates

Authors: Cabaraban, Maria Theresa, Noel Peter Tan, Rosie Lopez, Holden Itum, and Lucelyn Acac.

Conference title: Proceedings of the 2002 Symposium on Chemical Engineering, Manila, Philippines, 6-7 December 2002.

Article title: "Anaerobic Digestion of Kitchen and Yard Wastes."

Authors: Cabaraban, Maria Theresa, Noel Peter Tan, Rosie Lopez, Holden Itum, and Lucelyn Acac.

Conference title: Proceedings of the Regional Symposium on Chemical Engineering 2002, Petaling Jaya, Malaysia, 28-30 October 2002

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**ENGR. REYNALDO TED L. PEÑAS II***Public Administration*

Engr. Peñas is one of the S&T Fellows in DOST-ASTI. He is currently pursuing his PhD in Electronics Engineering in Mapua University. Currently, Engr. Peñas is involved in the EPDC Garage Launching of Products and Services, DOST-PNP Collaboration, and in the OCD-JICA DRRMCEP2 Inter-Working Group.

Sex: Male

Education

Doctor of Philosophy in Electronics Engineering, Mapua Institute of Technology, *ongoing*
Master of Science in Engineering major in Electronics Engineering, Polytechnic University of the Philippines, 2011

Bachelor of Science in Electronics & Communications Engineering, Pamantasan ng Lungsod ng Maynila, 2003

Field of Specialization

Data science and analytics

Electronics engineering

Researches:

Article title: Reduction of audio noise with lowpass chebyshev Type II filter simulated using GNU Octave

Authors: Reynaldo Ted L. Peñas II, Justine Clare T. Badajos, King Matthew P. Ochoa, Rex Albert P. Tejadilla

Conference title: 11th International Conference Humanoid Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM 2019) - Institute of Electrical and Electronics Engineers Inc. (IEEE) - Philippine Section, Fort Ilocandia Resort Hotel, Laoag, Ilocos Norte, Philippines, November 2019

Abstract:

Audio signal is one of the most used signals especially in the development of communication technology. One common audio signal is a human voice recording. In such signal, there is a segment called unvoiced recording. These segments were usually noise produced in the background or in the device used. This research proposes to simulate the removal of equipment and environmental noise in an audio using Digital Lowpass Chebyshev type II filter. Audio signal samples were gathered using a voice recorder device. The saved file will be filter using GNU Octave software. Then, the processed sound signals are amplified for higher power. The

filter designed lowpass filter was expected to attenuate the passband in the frequency of 200 Hz with 10 dB and the stopband in the frequency of 250 Hz, 275 Hz, and 300 Hz with 40 dB. Among the three different specifications of the filter, the filter that has a stopband frequency of 300 Hz exhibits the lowest value of mean and median error.

Full text available upon request to the author

Article title: Real-time vehicle parking logging system with the use of multi-layered artificial neural network

Authors: Reynaldo Ted L. Peñas II, Vince Harold Altura, Bonifacio Macabanti, Francis Nikko Ricardo, Mcab Ella Uy

Conference title: 1st International TechnoFest 2018 Information Technology and Engineering Convention, FEU - Institute of Technology

Abstract:

No abstract

Full text available upon request to the author

Article title: Simulated digital bandpass butterworth filter for noise reduction in ElectroCardioGram signal

Authors: Reynaldo Ted L. Peñas II, Daniella Distor, Ralph Clarenz Matociños, Gio Paulo Quezada, Arlande Rivera

Conference title: 1st International TechnoFest 2018 Information Technology and Engineering Convention, FEU - Institute of Technology

Abstract:

No abstract

Full text available upon request to the author

Article title: A finite impulse response to Hilbert Transformer for audio input signals with a sampling frequency of 11,025 Hz

Authors: Reynaldo Ted L. Peñas II, Ma Cecilyne P. Arellano, Angelica G. Caunca, Adriane Marie Esguerra, Gene Lawrence B. Lai, Darren Audrick S. Ortiz, Samuelle T. Tacud

Conference title: 1st International TechnoFest 2018 Information Technology and Engineering Convention, FEU - Institute of Technology

Abstract:

No abstract

Full text available upon request to the author

Article title: A bandpass filter impulse response to hilbert transformer for audio input signals with a sampling frequency of 44,100 Hz

Authors: Reynaldo Ted L. Peñas II, Albert A. Caloracan, Geovin V. Manimtim, Lance Albert R. Mendoza, Eula E. Sarmiento

Conference title: 1st International TechnoFest 2018 Information Technology and Engineering Convention, FEU - Institute of Technology

Abstract:

No abstract

Full text available upon request to the author

Article title: Discrete choice modeling of modal shift in ridership of mass rapid transit line 3 upon introduction of bus rapid transit system along Epifanio Delos Santos Avenue

Authors: Reynaldo Ted L. Peñas II, Lance Joseph Esquejo, Matthew Gutierrez, Cendrick Anthony S. Mendoza, Renzo P. Roldan

Conference title: 1st International TechnoFest 2018 Information Technology and Engineering Convention, FEU - Institute of Technology

Abstract:

No abstract

Full text available upon request to the author

Article title: Design evaluation of microcontroller-driven temperature, humidity and soil moisture control system for the cultivation of pleurotus florida mushroom in a controlled-environment plant box

Authors: Reynaldo Ted L. Peñas II, Ino Lorenz Ardiente, Armando San Diego Jr., Bea Mariz Bilbao, Jovert Valenzuela II

Conference title: De La Salle University Research Congress 2017

Abstract:

The study focused on maintaining the optimal growing temperature, humidity and soil moisture conditions of the Pleurotus Florida mushroom contained in a 730 × 510 × 430 mm controlled environment box. The design of the temperature and humidity control mechanism, driven with an estimated first- and second-order transfer function and an on-off control algorithm, is composed of a microcontroller device connected to a DHT22 temperature sensor, a heating lamp, a humidifier, and a cooling fan. The soil moisture control mechanism, driven by its own estimated first- and second-order transfer function and an alternating switching control algorithm, is comprised of the same microcontroller inter-connected between an SEN0193 capacitive soil moisture sensor, and a water sprinkler. At an ambient temperature of 33.4°C, the system was able to increase or decrease (by approximately 4°C) the temperature of the plant box to 27.5°C. At an ambient humidity of 56%, the proposed device was able to reach the 94% relative humidity of the plant box within the duration of about five minutes. This response was observed to have taken place between 11:00am to 3:00pm, and the plant box material took 13 minutes to cool down. The actual maximum increase that the humidifier can achieve is as high

as 29% relative humidity. This response took about 5 minutes using the on-off algorithm and has incurred a root-mean-square error of 6.241×10^{-5} or an equivalent 1.0489°C in a 30-minute stabilization duration. Considering a sampling interval of 12 microseconds, the rise time from 10% to 90% of the steady state value was observed to be at 485 microseconds with $\pm 2\%$ overshoot for the first-order approximation and 1,200 microseconds with 2.84% overshoot for the second-order approximation. The final prediction errors of the estimated transfer functions are 1.96×10^{-3} and 7.819×10^{-5} for the first- and second-order approximation respectively. Hence, the desired levels for temperature, humidity and soil moisture for optimal production of the said mushroom cultivated in a controlled-environment box can be simultaneously obtained by these results

Full text link <https://tinyurl.com/3f23dpxj>

Article title: A new continuous step-down DC-DC Converter

Authors: Reynaldo Ted L. Peñas II, Ren Marvin Chan, Gio Paulo R. Quezada, Ero S. Guiveces, John Carlo Limpin

Conference title: De La Salle University Research Congress 2017

Abstract:

No abstract

Full text available upon request to the author

Article title: Internal sound denoising for traditional stethoscope using inverse Chebyshev IIR Bandstop filter

Authors: Reynaldo Ted L. Peñas II, Andrien Vergel Vial, Alonzo Alterado

Conference title: De La Salle University Research Congress 2016

Abstract:

A stethoscope is a medical device for auscultation, or listening to the internal sound of the body. Heart auscultation is one of the most fundamental ways to evaluate heart function. The stethoscope can be used to auscultate respiratory sounds, lung sounds as well as heart sounds, and diagnose most of the cardiopulmonary disorders and other diseases. One of the factor that affects the internal sound measurement and analysis system in the traditional stethoscope is the ambient noise. Without the presence of the ambient noise, specifically the second and third heart sound which range from 1 to 10 dB, the primary heart sound can be heard at a power of -2 dB.

This research proposes to simulate the removal of ambient noise in a traditional stethoscope using an IIR Chebyshev II Bandstop filter. The internal sound acquiring system includes a traditional stethoscope, jacks for PC connection, an amplifier, and MATLAB R2013a software. First, the system records the internal sound data from traditional stethoscope, and the recorded data will transmit into a computer by using jack connection and save it in .WAVE and mp3 file. The saved file will be filter using MATLAB software. Then, the processed sound signals are amplified for higher power. Overall, the whole process is the digital filter design and

then amplified for more power.

This research aims to design and develop an Infinite Impulse Response (IIR) that can filter high frequency, since the second and third heart sounds range from 2 to 200 Hz which is higher than the first heart sound, to reduce these kinds of noise and make real-time digital signal processing. Also, this will increase the power of the first heart noise from -2dB to approximately 3 or 4 dB, which exceeds the mentioned range of the second and third heart sound. This filter aids the doctor in monitoring patient details accurately. Using this designed filter, patient can save his diagnosis and send to doctor for analysis.

Full text link <https://tinyurl.com/465szjfp>

Article title: Disaggregated electricity consumption baseline measurement of micro-, small, and medium enterprises in the Philippines, and behavioral response analysis to an intelligent energy management platform using real-time electricity monitoring with integrated analytics and recommendations engine

Authors: Reynaldo Ted L. Peñas II

Abstract:

No abstract

Full text available upon request to the author

Article title: Effect of rice husk ash as cement replacement in the compressive strength of hydraulic cement mortar cube

Authors: Reynaldo Ted L. Peñas II, Darla T. Ambas, Giovann Mikhael C. Dela Rosa, Lance Joseph Esquejo, Jomaris D. Gjol, Micah L. Magtalas, Cleo Jean D. Rubinas

Conference Title: 8th International Conference Humanoid Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM 2019) - Institute of Electrical and Electronics Engineers Inc. (IEEE)

Abstract:

This study introduces the use of Rice Husk Ash (RHA) as a cement replacement in testing the compressive strength of hydraulic cement mortar cubes. The sample cement and sand were acquired from a local hardware store and the RHA from rice mills of Bocaue, Bulacan. The sample mortars were molded from 2-in. cubes using a cement-sand ratio of 1:2.75 (1 part cement, 2.75 parts sand by weight). The samples were tested during its 15th day strength. Regression equations and correlation were obtained to provide the best fit curve that can be used in predicting the compressive strength of a cement mortar with RHA replacement. Other physical and chemical properties are not taken into notice in this study.

Full text available upon request to the author

Article title: Accuracy Improvement of ESPRIT-Extracted Direction-of-Arrival Estimates Using least mean-squares filter for passive RFID inventory application

Authors: Reynaldo Ted L. Peñas II and Jennifer C. dela Cruz, PhD

Conference title: 8th International Conference Humanoid Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM 2019) - Institute of Electrical and Electronics Engineers Inc. (IEEE)

Abstract:

This paper presents the use of least mean-squares filter to enhance the accuracy of the extraction of direction-of-arrival (DoA) estimates of a passive radio frequency identification (RFID) tag through Estimation of Signal Parameters via Rotational Invariance Techniques (ESPRIT) with a tag-reader system model that makes use of a two-element uniform linear array (ULA) in an inventory system. The use of the adaptive filter least mean squares algorithm (LMS), with step-sizes of 0.01, and 0.005, is designed to reduce the effect of backscattering noise and carrier leakage before extracting the DoA estimates by using the ESPRIT algorithm. The establishment of initialization in the simulation model done in MATLAB® involves random complex signals from angle measures negative 90 through positive 90 degrees measured on the broadside of the ULA. The addition of additive white Gaussian noise modeled as a random variable is included as the backscattered signal as it is received by the antenna array. The comparison of the results of the extracted estimates are done in reference to the actual DoA of the tag by measuring the difference in degrees as root-mean-square error. Simulated observations have also been executed in the case when signal-to-noise ratio (SNR) of the received signal is varied, and when the number of iterations of the filter is increased to present the speed of convergence of the estimates to the desired angle reading of the passive RFID tag.

Full text available upon request to the author

Article title: Statistical assessment on the charging and discharging cycles of five different brands of 700-mAh lithium ion mobile phone batteries

Authors: Reynaldo Ted L. Peñas II, Jasper T. Buenaflor, John Reniel S. Englis, Jude E. Mohamad, Moises John Paulo A. Pastoral, Charles Marc John B. Teston, Jason M. Volante

Conference title: 8th International Conference Humanoid Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM 2019) - Institute of Electrical and Electronics Engineers Inc. (IEEE)

Abstract:

No abstract

Full text available upon request to the author

Article title: Energy consumption behavior and analysis of residential households using real-time automated electricity monitoring and audit system

Authors: Reynaldo Ted L. Peñas II,

Abstract:

No abstract

Full text available upon request to the author

Article title: Assessment study of simulated per-building electrical energy consumption profile of Pamantasan ng Lungsod ng Maynila

Authors: Reynaldo Ted L. Peñas II and Evangeline P. Lubao

Conference title: De La Salle University Research Congress 2015

Abstract:

The Pamantasan ng Lungsod ng Maynila (PLM or also known as University of the City of Manila) is a premier local university that is subsidized by the City of Manila catering to marginalized but deserving students of the said city. Cost of electricity has been very expensive in the country recently that it has become one with the highest power rate in Southeast Asia. To aid the institution in assessing its expenditures in electricity, this paper presents a computer-simulated audit and calculation of energy consumption, in terms of kilowatt-hours, in each of the rooms and offices of PLM. A Pareto analysis is used to identify the types of equipment and the areas of the university that expends electrical energy. An analysis of cause-effect is also be utilized to recognize the factors that contribute to excessive power consumption. The result of the study has generated a simulated energy consumption footprint of the university and can be used as basis for recommending energy conservation measures to reduce the energy consumption cost.

Full text link <https://tinyurl.com/4nydcdkx>

Article title: Effect of varying the step-size of least mean squares filter in the accuracy of extraction of passive RFID Root-MUSIC Direction-of-arrival estimates

Authors: Reynaldo Ted L. Peñas II and Jennifer C. dela Cruz, PhD

Conference title: 7th International Conference Humanoid Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM 2019) - Institute of Electrical and Electronics Engineers Inc. (IEEE)

Abstract:

This work establishes the extraction of root-multiple signal classification (root-MUSIC) direction-of-arrival (DoA) estimates of a passive radio frequency identification (RFID) tag system with a reader that utilizes a two-element uniform linear array. The accuracy of the estimates can be improved by using an adaptive filter called least mean squares algorithm (LMS) to reduce the effect of noise and carrier leakage before the extraction is done. Through the use of a simulation, random complex signals are primarily set from angle bearings of -90 through positive 90 degrees, inclusive of carrier leakage and noise, characterized as additive, white, random, and Gaussian-distributed. The LMS filter, with step sizes of 0.008, 0.003 and 0.002, is designed to detect the deterioration of affected parameters of the complex signal in order to reduce the inaccuracy of the estimates as effects of the added distortion. The accuracy of the estimates are compared to the actual DoA of the tag by measuring the error in degrees and with respect to the variation of the step-size. Simulations have also been done to observe

the effect of signal-to-noise ratio (SNR) of the received signal and the increase of the number of samples taken before extraction, in addition to the variation of the step size of the filter.

Full text available upon request to the author

Article title: Accuracy enhancement performance of least mean-squares filter on Root-MUSIC Direction-of-arrival estimates for passive RFID application

Authors: Reynaldo Ted L. Peñas II

Conference title: De La Salle University Research Congress 2014

Abstract:

The study aimed to enhance the accuracy of Root-MUSIC direction-of-arrival (DoA) estimates of a passive radio frequency identification (RFID) tag system with a reader that utilizes a two-element uniform linear array (ULA). The enhancement of accuracy was made by using an adaptive filter called least mean squares algorithm (LMS) to reduce the effect of noise and carrier leakage before extracting the DoA estimates through root-multiple signal classification (rootMUSIC) algorithm. Initially, through the use of a simulation in MatLab®, random complex signals from angle bearings negative 90 through positive 90 degrees are established, including noise and carrier leakage added and characterized as additive, white, Gaussian-distributed random variable. An LMS filter, with step sizes of 0.005, 0.002 and 0.001, was designed to reduce the inaccuracy of the estimates by filtering the distortion-afflicted complex signal obtained at the front end of the receiver of the model established. Results of the estimates were compared to the actual DoA of the tag by measuring the discrepancy in degrees as root-mean-square error. Observations have also been done in the case when signal-to-noise ratio (SNR) of the received signal was changed, or when the number of iterations of the filter was varied to show how the convergence of the estimates to the true bearing of the passive RFID tag behaved in accordance to the said variations. The LMS filter has been very helpful in reducing the error in extracting the estimates and the DoA estimates converged to its real value when the step size of LMS is 0.001.

Full text link <https://tinyurl.com/yd4y49ef>

Article title: Enhancement of the accuracy of Root-MUSIC Direction-of-arrival estimates recursive least-squares algorithm

Authors: Reynaldo Ted L. Peñas II and Engr. Ben B. Andres

Conference title: Annual University Research Colloquium, 2011

Abstract:

No abstract

Full text available upon request to the author

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DR. AMERICUS D.C. PEREZ

Geochemistry

Dr. Perez is one of the S&T Fellows in DOST-PNRI. He received his PhD in Science from Kanazawa University in Japan wherein his dissertation focuses on the volcanic geology, petrology, and geochemistry of a juvenile arc sequence in northern Zambales ophiolite. Dr. Perez is currently involved in R&D program/project entitled the Philippines Remediation of Mine Tailings.

Sex: Male

Education:

Doctor of Philosophy in Science, Kanazawa University Japan, 2018

Bachelor of Science in Geology, University of the Philippines 2011

Field of Specialization:

Igneous Petrology and Geochemistry

Chemical Geodynamics

Ocean Floor Geoscience

Tectonic evolution of the Western Pacific Region

Early volcanic arc evolution and maturation

Ancient and modern marginal basins of the Western Pacific

Researches:

Article title: Origin and age of magmatism in the northern Philippine Sea basins

Authors: Osamu Ishizuka, Kenichiro Tani, Rex N. Taylor, Susumu Umino, Izumi Sakamoto, Yuka Yokoyama, Gen Shimoda, Yumiko Harigane, Yasuhiko Ohara, Chris E. Conway, Americus Perez, Shun Sekimoto

Publication title: Geochemistry, Geophysics, Geosystems 2021

Abstract:

A Robust tectonic reconstruction of the Philippine Sea Plate around ~52 Ma is a prerequisite in understanding the process of subduction initiation and establishment of the Izu-Bonin-Mariana arc. This study investigates origins and timing of basin formation in the still poorly understood oldest part of the northern Philippine Sea plate. We have established that andesitic magmatism in the form of the Northern Philippine Sea volcanics is widely distributed across this area. It is founded on both a Mesozoic arc terrane (Daito Ridge Group) and an intervening basin (Kita-Daito Basin). Their narrow Eocene age range (45-41 Ma) and lack of systematic spatial variation in geochemistry implies that this magmatism was not associated with on-going subduction, but related to the rifting/spreading event forming the Kita-Daito Basin. The arc-like

geochemistry of the volcanics seems to indicate melting of lithospheric mantle which had been previously metasomatized by Mesozoic subduction of a plate with Pacific-MORB isotopic characteristics. Late Eocene basaltic magmatism also found in the Kita-Daito Basin does not have arc-like characteristics, and could have formed from low-degree melts of asthenospheric mantle associated with the final stage of Kita-Daito Basin spreading. As onset of activity of the Northern Philippine Sea volcanics is essentially synchronous with the magmatism associated with the Oki-Daito mantle plume, it is possible that both magmatism and rifting of the Kita-Daito Basin were triggered by the arrival of the Oki-Daito mantle plume in this region. These results demonstrate that the Kita-Daito Basin postdates subduction initiation of the Pacific Plate along the Izu-Bonin-Mariana arc.

Full text link <https://doi.org/10.1029/2021GC010242>

Article title: Juxtaposition of Cenozoic and Mesozoic ophiolites in Palawan Island: New insights on the evolution of the Proto-South China Sea.

Authors: Jesley Mei A. Dycoco, Betchaida D. Payot, Gabriel Theophilus V. Valera, Florence Annette C. Labis, Julius A. Pasco, Americus D. C. Perez, Kenichiro Tani

Publication title: Tectonophysics 819: 229085, 2021

Abstract:

The proto-South China Sea (proto-SCS) is a fully consumed Mesozoic plate that once existed between the South China-Eurasian margin and Borneo. Remnants of this oceanic domain are believed to be emplaced as ophiolitic lithologies in Palawan and Zambales, Philippines and Borneo. Cretaceous and Eocene ophiolitic lithologies are exposed in the central and southern portions of Palawan island. The Eocene central Palawan Ophiolite (CPO) is composed of mantle peridotites, isotropic and layered gabbros, and massive and pillow lavas. In lieu of a sheeted dike complex, mafic dikes with distinct bake-and-chill margins cut the CPO, from the metamorphic sole to the crustal section. The Cretaceous southern Palawan Ophiolite (SPO) comprises of peridotite and pillow basalt exposures. Isotropic olivine gabbros are mainly preserved as floats. Troctolite and olivine gabbro dikes also cut the peridotites in the SPO.

The CPO crustal rocks and mafic dikes have dominantly back-arc basin basalt affinities. The SPO lithologies exhibit ocean island basalt-like signatures with a mafic dike showing island arc basalt-like compositions. A plagiogranite sample from Puerto Princesa indicates an Eocene age (40.01 ± 0.54 Ma) for the CPO. U-Pb dating of olivine gabbro and syenite floats yielded a minimum age of Early Cretaceous (100.73 ± 1.07 and 102.97 ± 1.07 Ma, respectively) for the SPO. This is the first reported radiometric age for the now completely subducted Mesozoic proto-SCS exposed in southern Palawan, which complements existing paleontological dates. Geochemical and geochronological characteristics of the SPO and CPO are similar to those of the Darvel Bay and Telupid Ophiolites in Borneo, which are interpreted to originate from the proto-SCS. The CPO and SPO are thus construed to represent fragments of the proto-SCS emplaced in Palawan. Complex tectonic processes in the region during the Cretaceous to Eocene led to the inception of multiple subduction and rifting events involving the proto-SCS.

Full text available upon request to the author

Article title: Proceedings of the Oman Drilling Project

Authors: Kelemen, P.B., Matter, J.M., Teagle, D.A.H., Coggon, J.A., and the Oman Drilling Project Science Team

Publication title: International Ocean Discovery Program Publications

Abstract:

No available

Full text link <https://tinyurl.com/8dvpstbm>

Article title: Boninite and boninite-series volcanics in northern Zambales ophiolite: Doubly-vergent subduction initiation along Philippine Sea Plate margins.

Authors: Americus Perez, Susumu Umino, Graciano P. Yumul Jr., and Osamu Ishizuka

Publication title: Solid Earth 9(3): 713-733, 2018

Abstract:

A key component of subduction initiation rock suites is boninite, a high-magnesium andesite that is uniquely predominant in western Pacific forearc terranes and in select Tethyan ophiolites such as Oman and Troodos. We report, for the first time, the discovery of low-calcium, high-silica boninite in the middle Eocene Zambales ophiolite (Luzon Island, Philippines). Olivine-orthopyroxene microphyric high-silica boninite, olivine-clinopyroxene-phyric low-silica boninite and boninitic basalt occur as lapilli fall deposits and pillow lava flows in the upper volcanic unit of the juvenile arc section (Barlo locality, Acoje Block) of the Zambales ophiolite. This upper volcanic unit overlies a lower volcanic unit consisting of basaltic andesite, andesite to dacitic lavas and explosive eruptive material (subaqueous pahoehoe and lobate sheet flows, agglutinate and spatter deposits) forming a low-silica boninite series. The overall volcanic stratigraphy of the extrusive sequence at Barlo resembles holes U1439 and U1442 drilled by IODP Expedition 352 in the Izu-Ogasawara (Bonin) trench slope. The presence of depleted proto-arc basalts in the Coto Block (45 Ma) (Geary et al., 1989), boninite and boninite series volcanics in Barlo (Acoje Block (44 Ma)) and simultaneous and post-boninite moderate-Fe arc tholeiites in Sual and Subic areas of the Acoje Block (44–43 Ma) indicate that the observed subduction initiation stratigraphy in the Izu-Ogasawara-Mariana forearc is also present in the Zambales ophiolite. Paleolatitudes derived from tilt-corrected sites in the Acoje Block place the juvenile arc of northern Zambales ophiolite in the western margin of the Philippine Sea plate. In this scenario, the origin of Philippine Sea plate boninites (IBM and Zambales) would be in a doubly vergent subduction initiation setting.

Full text link available upon request to the author

Article title: Geochemical and geophysical characteristics of the Balud Ophiolitic Complex (BOC), Masbate Island, Philippines: implications for its generation, evolution and emplacement.

Authors: Pearlyn C. Manalo, Carla B. Dimalanta, Decibel V. Faustino-Eslava, Betchaida D. Payot, Noelynna T. Ramos, Karlo L. Queaño, Americus D. C. Perez, and Graciano P. Yumul Jr.
Publication title: *Terrestrial, Atmospheric, Oceanic Sciences* 26 (6), 687-700, 2015

Abstract:

This paper presents the first field, geochemical and geophysical information on the recently recognized Early Cretaceous Balud Ophiolitic Complex (BOC) in the island of Masbate in the Central Philippines. Mapping of the western limb of the island revealed that only the upper crustal section of the BOC is exposed in this area. Geochemically, the pillow basalts are characterized by transitional mid-oceanic ridge basalt-island arc tholeiitic compositions. Gravity surveys yielded low Bouguer anomaly values that are consistent with the highly dismembered nature of the BOC. Short wavelength, high amplitude magnetic anomalies registered across the study area are attributed to shallow magnetic sources. This is taken to support the model that the ophiolitic complex occurs as thin crustal slivers that are not deeply-rooted in the mantle. Comparing BOC with other ophiolites in the Central Philippines, such as those in the islands of Sibuyan, Leyte and Bohol, suggests the possibility of a common or contiguous source for similarly-aged and geochemically composed crust-mantle sequences in the region.

Full text link <https://tinyurl.com/2ka9chs2>

Article title: Enriched and depleted characters of the Amnay Ophiolite upper crustal section and the regionally heterogeneous nature of the South China Sea mantle.

Authors: Americus d.C.Perez, Decibel V. Faustino-Eslava, Graciano P. Yumul Jr., Carla B. Dimalanta, Rodolfo A. Tamayo Jr., Tsanyao Frank, Yange Mei-Fu Zhou

Publication title: *Journal of Asian Earth Sciences* 65, 107-117, 2013

Abstract:

The volcanic section of the Middle Oligocene Amnay Ophiolite in Mindoro, Philippines has previously been shown to be of normal mid-oceanic ridge basalt (NMORB) composition. Here we report for the first time an enriched mantle component that is additionally recorded in this crustal section. New whole rock major and trace element data are presented for nine mafic volcanic rocks from a section of the ophiolite that has not been previously examined. These moderately evolved tholeiitic basalts were found to have resulted from the bulk mixing of ~10% ocean island basalt components with depleted mantle. Drawing together various geochemical characteristics reported for different rock suites taken as representatives of the South China Sea crust, including the enriched MORB (EMORB) and NMORB of the East Taiwan Ophiolite, the NMORB from previous studies of the Amnay Ophiolite and the younger ocean floor eruptives of the Scarborough Seamount-Reed Bank region, a veined mantle model is proposed for the South China Sea mantle. The NMORB magmatic products are suggested to have been derived from the more depleted portions of the mantle whereas the ocean island basalt (OIB) and EMORB-type materials from the mixing of depleted and veined/enriched mantle regions.

Full text available upon request to the author

Article title: Geology of northwestern Mindoro and its adjoining islands: Implications for terrane accretion in west central Philippines.

Authors: A. P. B. Canto, J. T. Padrones, R.A.B. Concepcion, A. D. C. Perez, R. A. Tamayo Jr., C. B. Dimalanta, D. V. Faustino-Eslava, K. L. Queaño, G. P. Yumul., Jr

Publication title: Journal of Asian Earth Sciences 61, 78-87, 2012

Abstract:

In over four decades, terrane studies of Mindoro Island have evolved from one terrane- to three terrane-models. Recent mapping of northwestern Mindoro and the islands of Lubang and Ambil roughly agrees with a 1990 suggestion that the island is composed of two terranes: the Central Range and the San Jose Platform. However, in contrast to this older model, our study, which takes into consideration the petrochemical and paleontological characteristics of the units, subdivides Northwest Mindoro into the Amnay Ophiolite and the Halcon Metamorphic terranes. Southwest-verging thrust faults parallel to the currently active Manila Trench demarcate the younger Amnay Ophiolite from the latter. Components of the older Mangyan Ophiolitic Complex, formerly thought to represent a terrane distinct from the metamorphic body, are now suggested to occur as disrupted bodies enclosed within the schists of the Halcon Metamorphics. The timing of incorporation of these megaclast materials and the regional metamorphism that occurred is constrained by the deposition of the sedimentary sequences of the Late Eocene Lasala Formation. Petrochemical studies of these younger sedimentary units reveal their continent-derived character. Therefore, accretion of the Cretaceous Mangyan Ophiolitic Complex marks the collision between the Cretaceous oceanic lithosphere and mainland Asia that is considered to be the protolith of the Halcon Metamorphics. A subsequent collision occurred which led to the amalgamation of the Amnay Ophiolite suite to the metamorphosed terrane.

Full text available upon request to the author

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**KURT LOUIS B. SOLIS***Advanced Analytical Instrumentation*

Mr. Solis is one of the S&T Fellows in DOST-PNRI. He received his M Eng degree in Environmental Engineering from Daegu University in South Korea. He has experience in handling various scientific instruments such as inductive coupled plasma optical emission spectroscopy, cold vapor atomic fluorescence spectroscopy, ion chromatography, x-ray diffractometry, and Fourier Transform infrared spectroscopy. Mr. Solis is currently involved in R&D program/project under DOST-PNRI in the Food Authenticity and Traceability (FAT) Using Isotope Techniques Program.

Sex: Male

Education:

Master of Engineering in Environmental Engineering, Daegu University South Korea, 2017

Bachelor of Science in Chemistry, University of the Philippines Diliman, 2014

Field of Specialization:

Environmental chemistry

Researches:

Article title: Reduction in mercury bioavailability to Asian clams (*Corbicula fluminea*) and changes in bacterial communities in sediments with activated carbon amendment

Authors: Mark Xavier Bailon, Minoh Park, Kurt Louis Solis, Yeong Na, Dhiraj Kumar Chaudhary, Sungpyo Kim, Yongseok Hong

Publication title: Chemosphere 291(1): 132700, 2021

Abstract:

Activated carbon (AC) amendment is considered as one of the alternatives for managing and remediating mercury (Hg) contaminated sediments because of its high sorptive capacity and potential to immobilize the contaminant. For this study, the underlying mechanisms that control the reduction of Hg bioavailability in AC-amended estuarine sediments were investigated in box microcosm set-ups with 28-day Asian clam bioassay experiments. The application of diffusive gradients in thin film technique (DGT) revealed that the total mercury and methylmercury levels in sediment pore water decreased by 60%–75% in 1%–3% AC-amended sediments. This decrease subsequently led to a linear reduction in the Hg body burden in Asian clams, even at 1% sorbent mixing. These observations implied that AC amendment reduced the net flux of Hg into the pore water and overlying water, resulting in reduced Hg bioaccumulation in benthic organisms. The addition of AC to sediment also led to reduced dissolved organic carbon and several biogeochemical indicators (HS⁻, Mn, and Fe) in the pore water. Furthermore, the 16 S rRNA gene amplicon sequencing analysis revealed noticeable alterations in the microbial communities after AC amendment. The predominant phylum was

Firmicutes in control sediment, Bacteroidetes in 1% AC-amended sediment, and Proteobacteria in both 2% and 3% AC-amended sediment samples. The genera-level analysis showed that the relative abundance of the Hg-methylators decreased as the level of AC amendment increased. These observations suggested that AC amendment decreased Hg bioavailability not only by physicochemical sorption but also by changing geochemical species and shifting the microbial community composition.

Full text link available upon request to the author

Article title: Sustainable removal of Hg(II) by sulfur-modified pine-needle biochar

Authors: Cheolho Jeon, Kurt Louis Solis, Ha-Rim An, Yongseok Hong, Avanthi Deshani, Igalavithana, Yong Sik Ok

Publication title: Journal of Hazardous Materials 388: 122048

Abstract:

Sulfur-modified pine-needle biochar (BC-S) was produced for the removal of Hg(II) in aqueous media via post-pyrolysis S stream exposure. Fourier-transform infrared spectroscopy, elemental analysis, and X-ray photoelectron spectroscopy confirmed the addition of S(0) groups on the surface of BC-S. Hg(II) adsorption on BC-S was best described by the Freundlich isotherm with a KF of 21.0 mg L g⁻¹ and a pseudo-second-order adsorption kinetics model with a rate of 0.35 g mg⁻¹ min⁻¹. Hg(II) removal on BC-S was found to be an endothermic process that relied on C-Hg and S-Hg interactions rather than reduction by S(0) groups. The adsorption increased with increasing solution pH and decreased with increasing dissolved organic matter concentration, but was unaffected by increasing salt concentrations. BC-S showed a maximum of 3 % S leaching in aqueous media after 28-d exposure time, and exposure to aqueous media did not convert Hg(II) to elemental Hg. Overall, BC-S exhibited superior Hg(II) removal performance over unmodified BC, thus having potential applications in natural water and wastewater treatment with no significant threat of secondary pollution.

Full text link available upon request to the author

Article title: Metal Organic Framework UiO-66 and activated carbon composite sorbent for the concurrent adsorption of cationic and anionic metals.

Authors: Kurt Louis B. Solis, Young-Hwan Kwon, Moon-Hyeon Kim, Ha-Rim An, Cheolho Jeon, Yongseok Hong

Publication title: Chemosphere 238: 124656, January 2020

Abstract:

A composite sorbent for the simultaneous removal of both Hg²⁺ and SeO₃²⁻ from aqueous media was produced from the solvothermal synthesis of a zirconium metal organic framework, UiO-66, in the presence of activated carbon. The composite sorbent has a large surface area of 1051 m² g⁻¹ with crystalized porous structures and has strong thermal stability up to 600 °C. The contaminant uptake of the sorbent follows a Langmuir adsorption isotherm with maximum sorption capacity of 205 mg g⁻¹ and 168 mg g⁻¹ for Hg²⁺ and SeO₃²⁻, respectively. Scanning

electron microscopy-energy dispersive spectroscopy results show that the Se regions overlap exclusively with Zr-rich regions suggesting that SeO_3^{2-} adsorption depends entirely on the exposed UiO-66 surface. In addition, X-ray photoelectron spectroscopy spectra of Se 3d and Hg 4f showed the association of SeO_3^{2-} and Hg_2^{2+} on the UiO-66 and carbon surfaces, respectively. The sorbent could facilitate the development of a single process for the simultaneous removal of cationic Hg and anionic Se as well as other similar ionic metals with opposite charges from aqueous media.

Full text link available upon request to the author

Article title: Spatiotemporal variation of groundwater arsenic in Pampanga, Philippines.

Authors: Kurt Louis B. Solis, Reygie Q. Macasieb, Roel C. Parangat, Jr., Augustus C. Resurreccion, Joey D. Ocon

Publication title: Water 12(9):2366, 2020

Abstract:

Several confirmed cases of arsenic (As) poisoning have been reported in Central Luzon, the Philippines, in recent years. There is a growing interest in As research in the Philippines due to the reported As poisoning cases. However, an extensive spatiotemporal As study has not been conducted. In this work, As concentration measurements were conducted in 101 wells in Guagua, Pampanga, in Central Luzon, the Philippines, from November 2018 to November 2019. The wells included 86 public hand pumps, 10 pumping stations, and 5 private, jet-powered pumps. Using hydride generation–inductively coupled plasma–optical emission spectroscopy (HG-ICP-OES), analysis of the wells in 12 barangays in Guagua revealed that 38.7% had average As concentrations beyond the 10 ppb limit with some wells having high Mn (4.0 ppm) and Fe (2.0 ppm) content as well. The high pH and reducing conditions in the wells in Guagua may have contributed to the persistence of As in the groundwater. The mean difference in wet season versus dry season As measurements were -4.4 (As < 10 ppb), -13.2 (10 to 50 ppb As), and -27.4 (As > 50 ppb). Eighty-three wells (82.2%) had higher As concentrations in the dry season, 8 wells (7.92%) had higher As concentrations in the wet season, 7 wells (6.93%) had no significant difference between the wet and dry season, and 3 wells had been decommissioned. These results indicate that there is a significant difference in As concentrations in the wet and dry seasons, and this could have implications in water treatment technology and policy implementation. The work resulted in the first year-long characterization of groundwater As in the Philippines.

Full text link <https://tinyurl.com/mrx3ea7b>

Article title: Effectiveness of gold nanoparticle-coated silica in the removal of Inorganic Mercury in aqueous systems: Equilibrium and Kinetic Studies.

Authors: Kurt Louis Solis, Go-Un Nam, Yongseok Hong

Publication title: Environmental Engineering Research, 21(1), 99–107, 2016

Abstract:

The adsorption of inorganic mercury, Hg (II), in aqueous solution has been investigated to evaluate the effectiveness of synthesized gold (Au) nanoparticle-coated silica as sorbent in comparison with activated carbon and Au-coated sand. The synthesis of the Au-coated silica was confirmed by x-ray diffraction (Bragg reflections at 38.2°, 44.4°, 64.6°, and 77.5°) and the Au loading on silica surface was 6.91±1.14 mg/g. The synthesized Au-coated silica performed an average Hg adsorption efficiency of ~96 (±2.61) % with KD value of 9.96 (±0.32) L/g. The adsorption kinetics of Hg(II) on to Au-coated silica closely follows a pseudo-second order reaction where it is found out to have an initial adsorption rate of 4.73 g/μg/min/ and overall rate constant of 4.73×10^{-4} g/μg/min/. Au-coated silica particles are effective in removing Hg (II) in aqueous solutions due to their relatively high KD values, rapid adsorption rate, and high overall efficiency that can even decrease mercury levels below the recommended concentrations in drinking water.

Full text link <https://tinyurl.com/ymcdzkc2>

Article title: Mercury(II) reduction and sulfite oxidation in aqueous systems: kinetics study and speciation modeling

Authors: Kurt L. B. Solis A , Go-un Nam A and Yongseok Hong

Publication title: Environmental Chemistry, 14(3), 151, 2017

Abstract:

Environmental context Wastewater contains various substances such as sulfur-containing chemicals and heavy metals including mercury ions. Several technologies have been developed to trap mercury ions; however, mercury can undergo reactions with sulfite and change to its vapour form, which easily escapes to the atmosphere. Here, we devised a model to predict the formation of vapour-phase mercury as a function of sulfite concentration, temperature and water acidity based on coal-fired power plant wastewater. Abstract The re-emission of mercury (Hg) as a consequence of the formation and dissociation of the unstable complex HgSO_3 is a problem encountered in flue gas desulfurisation treatment in coal-fired power plants. A model following a pseudo-second-order rate law for Hg^{2+} reduction was derived as a function of $[\text{SO}_3^{2-}]$, $[\text{H}^+]$ and temperature and fitted to experimentally obtained data to generate kinetics rate values of 0.120 ± 0.04 , 0.847 ± 0.07 , $1.35 \pm 0.4 \text{ mM}^{-1}$ for 40°C, 60°C and 75°C respectively. The rate of reduction of Hg^{2+} increases with a temperature increase but shows an inverse relationship with proton concentration. Plotting the model-fit kinetics rate constants yields $\Delta H \leq 61.7 \pm 1.82 \text{ kJ mol}^{-1}$, which is in good agreement with literature values for the formation of Hg_0 by SO_3^{2-} . The model could be used to better understand the overall Hg^{2+} re-emission due to SO_3^{2-} -happening in aquatic systems such as flue gas desulfurisation wastewaters.

Full text link available upon request to the author

Article title: KOH activated pine tree needle leaves biochar as effective sorbent for VOCs in water.

Authors: Nshirirungu Theoneste, Moon Hyun Kim, Kurt Louis Solis, Minoh Park and Yongseok Hong

Publication title: Membrane Water Treatment, 9(5), 293-300, 2018

Abstract:

The removal of volatile organic compounds (VOCs) from water using KOH-activated pine tree needle leaves biochar is considered a cost effective and efficient process. In this study, pine tree needle leaves were mixed with 0, 50, 100 and 200% (KOH weight/feedstock weight) of KOH, respectively. Then, the mixture was pyrolyzed at 500 degree celcius for 6 hrs. The adsorption characteristics of 10 VOCs to the biochar were tested. The results indicated that the removal efficiency of the KOH activated biochar was highest in 100% KOH-biochar. The VOC removal efficiencies of 50% and 200% KOH activated biochar were similar and the 0% KOH activated biochar showed the lowest VOC removal. The FTIR results showed that increasing the amount of KOH seemed to enhance the formation of various functional groups, such as -OH, -C=C, -O. The adsorption strength of 10 VOCs to the KOH activated biochar seemed to be increasing by the increase of the solubility of VOCs. This may suggest that the adsorption is taking place in hydrophilic sites of the biochar surface. The KOH activated pine tree needle leaves biochar can be an effective sorbent for VOCs removal in water and 100% KOH mixing seemed to provide better sorption capacity.

Full text link available upon request to the author

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**DR. EDUARDO D. PIEDAD, JR.***Electrical Engineering*

Dr. Piedad is one of the S&T Fellows in DOST-ASTI. He is currently a PhD student at Universitat Polytechnica de Catalunya, Barcelona Spain taking up Electrical Engineering and a full time faculty at the same university.

Sex: Male

Education:

Doctor of Philosophy in Electrical Engineering, Universitat Polytechnica de Catalunya (UPC),
ongoing

Master of Science in Electrical Engineering, National Taiwan University of Science and
Technology, Taipei Taiwan, 2019

Bachelor of Science in Electrical Engineering, Mindanao State University-Iligan Institute of
Technology, 2015

Field of Specialization:

Electrical Engineering

Researches:

Article title: Teamwork competency and satisfaction in online group project-based engineering
course: The cross-level moderating effect of collective efficacy and flipped instruction

Authors: Nicholas O. Awuor, Cathy Weng, Eduardo Piedad, Jr., Roel Militarb

Publication title: Computers & Education 176:104357

Abstract:

This study examined the relationship between students' teamwork competency and satisfaction in a synchronous online flipped group project-based course, focusing on the possibility of group collective efficacy and flipped learning to moderate this relationship. We collected data from 19 teams (N = 75 college engineering students) at a science and technology university in Cebu, central Philippines, through a questionnaire survey over a 12-week synchronous online course. Multi-level hierarchical linear modeling test of hypotheses revealed a significant positive relationship between teamwork competency and satisfaction. Similarly, group collective efficacy recorded a significant relationship with satisfaction. At the team level, group collective efficacy and flipped learning moderated the relationship between teamwork competency and satisfaction. Learners in groups with high collective efficacy and online flipped learning showed

a stronger relationship than those with low efficacy and conventional online instruction. The findings and discussions provide practical implications and possible interventions teachers could apply to enhance collective efficacy and boost learning satisfaction in synchronous collaborative online learning settings.

Full text available upon request to the author

Article title: Frequency Occurrence Plot-Based Convolutional Neural Network for Motor Fault Diagnosis

Authors: Eduardo Piedad, Jr., Yu-Tung Chen, Hong-Chan Chang, Cheng-Chien Kuo

Publication title: Electronics 9(10), 1711, 2020

Abstract:

A novel motor fault diagnosis using only motor current signature is developed using a frequency occurrence plot-based convolutional neural network (FOP-CNN). In this study, a healthy motor and four identical motors with synthetically applied fault conditions—bearing axis deviation, stator coil inter-turn short circuiting, a broken rotor strip, and outer bearing ring damage—are tested. A set of 150 three-second sampling stator current signals from each motor fault condition are taken under five artificial coupling loads (0, 25%, 50%, 75% and 100%). The sampling signals are collected and processed into frequency occurrence plots (FOPs) which later serve as CNN inputs. This is done first by transforming the time series signals into its frequency spectra then convert these into two-dimensional FOPs. Fivefold stratified sampling cross-validation is performed. When motor load variations are considered as input labels, FOP-CNN predicts motor fault conditions with a 92.37% classification accuracy. It precisely classifies and recalls bearing axis deviation fault and healthy conditions with 99.92% and 96.13% f-scores, respectively. When motor loading variations are not used as input data labels, FOP-CNN still satisfactorily predicts motor condition with an 80.25% overall accuracy. FOP-CNN serves as a new feature extraction technique for time series input signals such as vibration sensors, thermocouples, and acoustics.

Full text link <https://tinyurl.com/dcqvjjdk>

Article title: Determining Philippine coconut maturity level using machine learning algorithms based on acoustic signal

Authors: June Anne Caladcad, Shiela Cabahug, Mary Rose Catamco, Paul Elyson Villaceran, Leizel Cosgafa, Karl Norbert Cabizares, Marfe Hermosilla, Eduardo Jr. Piedad

Publication title: Computers and Electronics in Agriculture 172:105327, 2020

Abstract:

Advanced intelligent systems are becoming significant to many sectors, including farming. In agriculture, the intelligent classification of post-harvested fruits seems to have a direct impact on farmers, mainly for export products. Unlike other popular fruits, coconuts tend to have limited studies due to its tropical nature grown in developing countries as well as its unique physical structure. In this study, a classification of real coconut datasets is performed based on

acoustic signals acquired through a developed tapping system and learned by three widely-used machine learning techniques - artificial neural network (ANN), random forest (RF) and support vector machine (SVM). There are 129 coconuts samples, each classified into three maturity levels - pre-mature, mature, and over-mature. A three-second tapping system gathered from each sample a total of 132,300 data points, which underwent noise reduction and signal processing. Each machine learning model predicts the class of the fruit by learning the patterns of the transformed frequency spectrums of each sample signal. Based on ten times cross-validated results, the three machine learning algorithms satisfactorily predicted the maturity level of coconuts with at least 80% classification accuracy. All models correctly predicted over-mature coconuts but confused in classifying pre-mature with mature and mature with over-mature coconuts. RF model outperformed the other models with efficiencies of 90.98% and 83.48% accuracies for training and testing, respectively. The imbalance data for each coconut class can be addressed to give better results. Additionally, the prepared coconut dataset may use more advanced deep learning techniques.

Full text available upon request to the author

Article title: Deep learning for noninvasive classification of clustered horticultural crops - A case for banana fruit tiers

Authors: Tuan-Tang Le, Chyi-Yeu Lin, Eduardo Jr Piedad

Publication title: Postharvest Biology and Technology

Abstract:

Practical classification of some horticultural crops such as banana tiers, lanzones and grapes come into clusters instead of individual classification. Unlike most of classification studies, clustered crops are rarely studied due to their complex physical structure. A noninvasive deep learning classification of clustered banana given only a single image feature has been developed as a pioneering deep learning study for clustered horticultural crops. In recent deep learning developments, mask region-based convolution neural networks, also known as Mask R-CNN, show unique applications in image recognition by detecting objects within an image while simultaneously generating segmentation masks. With Mask R-CNN, detection of the complex banana fruit within an image predicts the banana class while at the same time generating a mask separating the fruit from its background. A real dataset is used based on banana tiers and the developed model discriminates normal from abnormal tiers. Unlike the previous general machine learning study, which discriminates reject class from normal class with classification accuracy of 79%, our deep learning model obtained a better averaged accuracy of 92.5%. The previous average weighted accuracy of 94.2% also improved to 96.1% with only a single image feature instead of tedious multiple image and size features. With data augmentation, the model slightly improved into 93.8% accuracy on classifying reject class and 96.5% for overall accuracy. Having successfully implemented in banana tiers, this deep learning classification can also serve as basis for other clustered horticultural crops.

Full text available upon request to the author

Article title: Energy Consumption Load Forecasting Using a Level-Based Random Forest Classifier

Authors: Yu-Tung Chen, Eduardo Piedad, Jr, Cheng-Chien Kuo

Publication title: Symmetry 11(8), 956, 2019

Abstract:

Energy consumers may not know whether their next-hour forecasted load is either high or low based on the actual value predicted from their historical data. A conventional method of level prediction with a pattern recognition approach was performed by first predicting the actual numerical values using typical pattern-based regression models, then classifying them into pattern levels (e.g., low, average, and high). A proposed prediction with pattern recognition scheme was developed to directly predict the desired levels using simpler classifier models without undergoing regression. The proposed pattern recognition classifier was compared to its regression method using a similar algorithm applied to a real-world energy dataset. A random forest (RF) algorithm which outperformed other widely used machine learning (ML) techniques in previous research was used in both methods. Both schemes used similar parameters for training and testing simulations. After 10-time cross training validation and five averaged repeated runs with random permutation per data splitting, the proposed classifier shows better computation speed and higher classification accuracy than the conventional method. However, when the number of its desired levels increases, its prediction accuracy seems to decrease and approaches the accuracy of the conventional method. The developed energy level prediction, which is computationally inexpensive and has a good classification performance, can serve as an alternative forecasting scheme

Full text link <https://tinyurl.com/59zfuddo>

Article title: Postharvest classification of banana (*Musa acuminata*) using tier-based machine learning

Authors: Eduardo Jr Piedad, Juliaza I. Larada, Glydel J. Pojas, Laura Vithalie V. Ferrer

Publication title: Postharvest Biology and Technology 145

Abstract:

Manual classification of horticultural products contributes to postharvest losses but technology and emerging algorithms offer solutions to reduce such losses. A practical fruit classification of banana (*Musa acuminata* AA Group 'Lakatan') using machine learning is developed based on tier-based classification instead of classifying individually ("finger") for practical purpose. Fruit were classified into extra class, class I, class II and reject class, and compared using three widely-used machine learning classifiers – artificial neural network, support vector machines and random forest. Given only four features of banana tier, the red, green, blue (RGB) color values and the length size of the top middle finger of the banana tier, all three models performed satisfactorily. The highest classification accuracy of 94.2% was achieved using random forest classifier. In addition, ignoring the reject class, which cannot be easily predicted using only the given features, at least 97% accuracy can be achieved in all other three classes.

Non-invasive tier-based classification is a practical postharvest technique that can be applied not only for banana but also for other fruit and horticultural products.

Full text available upon request to the author

Article title: A Sound-based Machine Learning to Predict Traffic Vehicle Density

Authors: Geofereen Flores, Eduardo Jr. Piedad, Anzeneth Figueroa, Romari Tumamak, Nesrah Jane Marie Berdon

Publication title: Recoletos Multidisciplinary Research Journal 9(1): 55–62, 2021

Abstract:

Traffic flow mismanagement is a significant challenge in all countries especially in crowded cities. An alternative solution is to utilize smart technologies to predict traffic flow. In this study, frequency spectrum describing traffic sound characteristics is used as an indicator to predict the next five-minute vehicle density. Sound frequency and vehicle intensity are collected during a thirteen-hour data gathering. The collected sound intensity and frequency are then used to learn three machine-learning models - support vector machine, artificial neural network, and random forest and to predict vehicle intensity. It was found out that the performances of the three models based on root-mean-square-error values are 12.97, 16.01, and 10.67, respectively. These initial and satisfactory results pave a new way to predict traffic flow based on traffic sound characteristics which may serve as a better alternative to conventional features.

Full text available upon request to the author

Article title: A Computer Vision Application for Measuring the Deflection in a Two-dimensional View of Reinforced Concrete Beams

Authors: Eduardo Jr. Piedad, Barne Roxette Carpio, Kristine Sanchez, Marven Jabian

Publication title: Recoletos Multidisciplinary Research Journal 9(1): 13–21, 2021

Abstract:

A novel computer vision application is developed to measure the deflection of two-dimensional (2D) reinforced concrete structural members. Eight beam samples, with dimensions of 160 mm x 150 mm x 1400 mm are loaded and simulated under a four-point loading test until failure using a reaction framework machine. A camera is fixed at the center front view of the concrete beams to capture the deflection of the samples while testing. In each test, a dial indicator is installed and the maximum deflection is manually recorded. Based on the results, the maximum deflection values recorded by the proposed application obtained an average error of 18.38 % when compared to the manual measured results. This indicates that computer vision-based application can provide a beam-wide scale deflection performance, compared to the traditional point-based deflection reading. This study paves a new possibility of aiding manual measurements of concrete beams and all other structural studies.

Full text available upon request to the author

Article title: Optimal Scheduling of Battery Energy Storage for Grid-Connected Load Using Photovoltaic System (PV) via Binary Particle Swarm Optimization (BPSO)

Authors: Eduardo D. Piedad Jr., Marc Edwin F. Montilla, Mark Joseph E. Ortega

Publication title: Recoletos Multidisciplinary Research Journal, 4(2), 2016

Abstract:

This paper presents an optimal dispatch of battery storage and its economic viability with a photovoltaic system. There are four modelled scenarios based on the combination of interruptible load program and the time-of-use scheme. The scenarios were modelled using a Binary Particle Swarm Optimization and were simulated using Matlab v6. In all the scenarios, this model successfully optimizes the battery dispatch scheduling while simultaneously minimizes the DUTMs penalty from exceeding the maximum allowable power demand. This algorithm also optimizes the linearly forecasted demand for the next six year for all the scenarios. Then, an economic analysis for the possible investment to the combined BESS and PV system is conducted through the comparison of the payback periods of each scenario. The first scenario is implemented without ILP and a ToU scheme and has 79.86 payback years. With ILP scheme only, the second scenario has 33.37 payback years. Then the third scenario with ToU scheme only has a 30.29 payback years. Finally, the fourth scenario, with both ILP and ToU schemes, shows the fastest recovery of the investment with 21.57 payback years. Thus the combination of both ILP and ToU schemes provide the best economic benefit. Though the current proposed system is still not economically feasible however the foreseen positive trends on solar and battery technologies will make this system viable.

Full text available upon request to the author

Article title: Displacement and Illumination Levels Effect on Short-distance Measurement Errors of Using a Camera

Authors: Eduardo D. Piedad Jr. and Ricky B. Villeta

Publication title: Recoletos Multidisciplinary Research Journal 4(1)., 2016

Abstract:

Using a camera for measurement reading is simplified through the incorporation of computer vision application. The variations in the environmental's setting, however, may constitute to the occurrence of measurement errors. A study investigated the significant effect of changing the camera-to-lens displacements and the variations of the illumination level on the short-distance measurement reading. This is performed initially by developing an actual setup calibrated though the comparison with the hypothesized values. Then, an experiment on this calibrated setup generates the measurement results of varying the displacement positions and the illumination levels. Through descriptive and comparative statistical analysis, there is evidence that the variations of the displacement alone do not significantly change the measurement results. Similarly, the variations in the illumination levels do not also constitute significant changes on the measurement results. Hence, each of the variables bears no contribution on the occurrence of the measurement error of using camera. It is further confirmed through the two

way analysis of variance that there is no significant difference on the displacement positions and illumination levels, and on their interactions. These results verified that a camera can be used as a short-distance measurement tool adequately regardless on the object-to-lens displacement positions and on the illumination levels.

Full text available upon request to the author

Article title: Various Trends on the National Development of Renewable Energy Source Affecting the Natural Resource Depletion

Authors: Eduardo D. Piedad Jr.

Publication title: Recoletos Multidisciplinary Research Journal 4(1), 2016

Abstract:

Renewable energy sources are foreseen to rise as they become scarce and expensive fossil fuels. Considering this thought, each country implements different strategies and national policies to support the development of renewable sources. However, these emerging developments may contribute to its depletion of natural sources. In this paper, an exploratory pattern analysis was used on 125 selected countries to determine the underlying trends on the effect of the development of renewable energy (RE) sources while utilizing the countries' natural resources. Due to different status of each country, the trends were grouped in similar associations such as negative, positive and bell-like relationships. Developed countries showed a negative relationship where the natural resources are heavily utilized in the early stages but rapidly decreased as the RE progresses. This reflects the capability of these countries with high to very-high human development index (HDI) to invest more on advanced technologies which utilize fewer natural resources. On the other hand, the underdeveloped countries with low to moderate HDI behave in a positive relationship showing their heavily dependence on its natural resources as RE progresses. Moreover, a group of developing countries between developed and underdeveloped categories and without direct relationship to HDI showed a transition between positive to negative transition as the RE progresses.

These findings support the international policymakers, developers and investors on RE market justifications and entrustments, and fair RE policies such as the integration of Carbon Footprint Policy.

Full text available upon request to the author

Papers Presented:

Article title: Vehicle Count System based on Time Interval Image Capture Method and Deep Learning Mask R-CNN

Authors: Eduardo Jr Piedad; Tuan-Tang Le; Kimberly Aying; Fhenyl Kristel Pama; Ianny Tabale

Conference title: : TENCON 2019 - 2019 IEEE Region 10 Conference (TENCON)

Article title: Energy Consumption Level Prediction Based on Classification Approach with Machine Learning Technique

Authors: Hong-Chan Chang, Cheng-Chien Kuo, Yu-Tung Chen, Wei-Bin Wu, Eduardo Jr Piedad

Conference title: Proceedings of the 4th World Congress on New Technologies (NewTech'18)
Madrid, Spain – August 19 – 21, 2018

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**DR. GILBERT U. YU***Institutional Development*

Dr. Yu is one of the S&T Fellows in DOST-PCIEERD. His research interest is in materials chemistry, particularly in supramolecular and macromolecular synthesis, metal organic frameworks, and polymer/silicone functionalization.

Sex: Male

Education:

Doctor of Engineering, Tokyo Institute of Technology, Japan, 2012

Master of Science in Chemistry, McMaster University, Canada, 2008

Master of Science in Chemistry, Ateneo de Manila University, Philippines, 2005

B.S. in Management of Applied Chemistry, Ateneo de Manila University, Philippines, 1999

Field of Specialization:

General Chemistry

Organic Chemistry

Analytical Chemistry

Instrumentation Chemistry

Physical Chemistry

Researches:

Article title: Facile Grignard Reaction Demonstration Using Molecular Sieved Dried Solvent

Authors: Jude M. Reyes, John Vincent M. Tumaneng, and Gilbert U. Yu

Publication title: ACS Chemical Health and Safety 29(1): 49-53, 2022

Abstract:

Methods involving C–C bond formation are continuously being innovated due to their importance in the creation and modification of important organic molecules. The classic Grignard reaction demonstrates C–C bond formation with reagents that are usually accessible in undergraduate laboratory classes. Oftentimes, to make the Grignard reaction viable, the reactions are assisted by heating at elevated temperatures or with the use of a catalyst accompanied by solvents that have been dried using highly reactive sodium metal (Na⁰)—conditions which increase the risk of a laboratory fire or explosion. For this work, a method to conduct Grignard reactions under mild conditions utilizing sand-paper-polished Mg ribbons and solvent dried using molecular sieves was developed. The conscientious, accessible, and easy-to-follow preparation of both the solvent and the Mg ribbons is found to contribute

more to the percent conversion of reagents to products. The average percent conversion with the proposed method ranged from 76.8% to 99.5% based on ^1H NMR results. This makes the Grignard demonstration possible even for the most humid, tropical locations.

Full text link available upon request to the author

Article title: Formulating 3-Chloropropyltriethoxysilane Modified Silica Nanoparticle Sprays as Hydrophobic Transparent Coatings onto Cotton Textiles

Authors: Mikaela C.S. Mendoza and Gilbert U. Yu

Publication title: Philippine Journal of Science 150(3): 1069-1076

Abstract:

Cotton textiles were transformed into hydrophobic fabrics via the application of 3-chloropropyltriethoxysilane-functionalized silica nanoparticle spray coatings. Silica particles were measured to be < 50 nm, as determined by dynamic light scattering (DLS). The incorporation of hexadecyltrimethylammonium bromide (HTAB), a surfactant, into the nanosilica alcohol-based sprays resulted in a suspension that was stable for at least a week. Stability and turbidity tests of samples point to smaller particle size (silica nanoparticles = 24.3 ± 8.5 nm) as the main contributor to possibly providing transparency, as evidenced when sprayed in colored (black) textiles, while still contributing to hydrophobicity/ superhydrophobicity of the cloth.

Full text link <https://tinyurl.com/3xf4wnmw>

Article title: Cationic and Neutral Rotaxanes Having Different Functional Groups in the Axle Molecule and Their Coordination to Pt(II) ,

Authors: Gilbert Yu, Yuji Suzuki, Kohtaro Osakada

Publication title: Chemistry: Asian journal 12(3):372-377, 2017

Abstract:

Dibenzo[24]crown-8 (DB24C8) forms rotaxanes with a linear molecule having a dialkylammonium group and a triazole group as well as with the acetylation product of a cationic axle molecule. The former cationic rotaxane is stabilized by multiple intermolecular hydrogen bonds between the NH_2^+ and oxyethylene groups. The neutral rotaxane contains the macrocycle in the vicinity of the terminal aryl group. The co-conformation of both the cationic and neutral rotaxanes can be fixed by coordination of the triazole group of the axle molecule to $\text{PtCl}_2(\text{dmsO})_2$. A ^1H NMR spectroscopic study on the thermodynamics of the Pt coordination revealed a larger association constant for the rotaxanes than for the corresponding axle molecules and a larger value for the neutral rotaxane than for the cationic rotaxane.

Full text link available upon request to the author

Article title: Ferrocene-containing [1]-, [2]-, [3]-and [4]rotaxanes Synthesized From a Common Precursor

Authors: Gilbert Yu, Yuji Suzakia and Kohtaro Osakada

Publication title: RSC Advances 6:41369-41375, 2016

Abstract:

The Cu-catalyzed reaction of a dialkylammonium, having ferrocenyl and hexynyl end groups, $\text{FcCH}_2\text{NH}_2\text{CH}_2\text{C}_6\text{H}_4-4-\text{O}(\text{CH}_2)_4\text{CCH}]\text{PF}_6$ ($\text{Fc} = \text{Fe}(\text{C}_5\text{H}_4)(\text{C}_5\text{H}_5)$), with a crown ether having an azidemethyl side-arm yields a [1]rotaxane composed of a single molecule. The crystal structure of the [1]rotaxane suggests an arrangement where the 1,4-phenylene ring is tilted at 22° close to the catechol ring rather than in a parallel alignment. Another dialkylammonium with ferrocenyl and alkynyl terminal groups, $[\text{FcCH}_2\text{NH}_2\text{CH}_2\text{C}_6\text{H}_4-4-\text{O}(\text{CH}_2)_4\text{CCH}]\text{PF}_6$, reacts with aromatic compounds with one to three azide groups in the presence of dibenzo[24]crown-8-ether (DB24C8) and $[\text{Cu}(\text{MeCN})_4]\text{PF}_6$ catalyst, to afford the corresponding [2]-[4]rotaxanes. The products contain DB24C8 molecules as the cyclic components which are bound to the ammonium group of the axle component with $\text{NH}\cdots\text{O}$ hydrogen bonding. The [3]rotaxane having two triazole groups on the axle component reacts with $\text{PdCl}_2(\text{MeCN})_2$ to yield mono- and di-palladium complexes with different conformations of the axle component.

Full text link available upon request to the author

Article title: Content Analysis of the Discussion of the Atom in General Chemistry Textbooks Using Evaluation Criteria Based on the Nature of Science and Philosophy of Chemistry

Authors: Angelo Julian E. Perez, Armando, Jr. M. Guidote, Gilbert U. Yu, Michael Ner E. Mariano

Publication title: Kimika 27(2): 50-62, 2016

Abstract:

Evaluation criteria are adapted from previous textbook analyses on the nature of science (NOS) in general chemistry textbooks. These criteria are used to determine how certain NOS dimensions are mentioned and elaborated in those textbooks. Such dimensions emphasize that chemistry is (1) tentative, (2) empirical, (3) model-based, (4) inferential, (5) has technological products, (6) employs instrumentation, and (7) possesses social and societal dimensions. Three book chapters were read and evaluated: the first (on chemistry in general); the second (on atomic structure); and the sixth or seventh chapters (on the electronic structure of atoms). The relevant content in each textbook were rated using the following rubric: Satisfactory and Explicit (S, 2 points); Mention and Implicit (M, 1 point); and No Mention (N, 0 point). Silberberg (2009) has the highest score among the six textbooks with 12 points out of the maximum of 14. It was rated S for five criteria, the most among the six textbooks. Despite the presence of some N evaluations, all textbooks have mentioned some or all of the NOS dimensions formulated, resulting to M and S ratings. This study concludes that NOS dimensions are already present in various ways and varying degrees in each textbook.

Full text available upon request to the author

Article title: Silica Nanospheres Functionalized by Ferrocene-containing [2]Rotaxane,

Authors: Gilbert Yu, Yuji Suzuki, Yujin Maekawa, Tomoko Abe, Kohtaro Osakada, Toshiyuki Yokoi

Publication title: Chemistry Letters 43(6): 953-955, 2014

Abstract:

Rotaxane having ferrocenyl group at a terminal of the axle molecule was immobilized to the surface of silica nanospheres by condensation of the triethoxysilyl terminal group with OH groups of the silica.

Full text link available upon request to the author

Article title: Introduction of Ferrocene-containing [2]Rotaxanes onto Siloxane, Silsesquioxane and Polysiloxanes via Click Chemistry

Authors: Gilbert Yu, Yuji Suzuki, Tomoko Abea and Kohtaro Osakada

Publication title: Dalton Transactions 42: 1476-1482, 2013

Abstract:

The reaction of $N_3(CH_2)_3Si(OTMS)_3$ (TMS = $SiMe_3$) with a dialkylammonium having hexynyl group 1, $[FcCH_2NH_2CH_2C_6H_4-4-O(CH_2)_4C\text{[triple bond, length as m-dash]}CH]PF_6$ (Fc = $Fe(C_5H_4)(C_5H_5)$), in the presence of dibenzo[24]crown-8-ether (DB24C8) and $[Cu\{Fe(CN)_4\}]PF_6$ catalyst yielded the [2]rotaxane containing the dialkylammonium unit terminated by a bulky silyl group. Azides with a silsesquioxane group react similarly to form the corresponding [2]rotaxanes having a bulky silsesquioxane end group. The azide-functionalized polysiloxane, $[-O-SiMe\{(CH_2)_3N_3\}-]_n[-O-SiMe_2-]_m$ also undergoes a click reaction with 1 to produce the side chain polyrotaxane. Cyclic voltammograms of these rotaxanes and 1 [(DB24C8)1] show the Fe(II)/Fe(III) redox at the same potential, but with different current depending on their molecular weights. Addition of $PdCl_2(MeCN)_2$ to a solution of the side-chain polyrotaxane forms gel which regenerates the sol upon addition of PPh_3 .

Full text available upon request to the author

Article title: Organometallic Rotaxanes with a Triazole Group in the Axle Component and Their Behavior as Ligands of Pt(II) Complexes;

Authors: Gilbert Yu, Yuji Suzuki, Tomoko Abe, Kohtaro Osakada

Publication title: Chemistry: an Asian Journal 7(1):207-13, 2012

Abstract:

Two ferrocenylmethyl ammonium salts were used as axle components of pseudorotaxanes with dibenzo[24]crown-8. The pseudorotaxane with an alkyne terminal group in the axle component underwent a Cu-catalyzed Huisgen coupling reaction (click reaction) with an alkyl azide to afford cationic [2]rotaxanes with a triazole group in the axle molecule. The rotaxane reacted with Ac_2O to produce neutral rotaxanes with an amide group in the axle component. Both

cationic and neutral rotaxanes were treated with $K[PtCl_3(CH_2=CH_2)]$ to form the Pt(II)-containing rotaxanes.

Full text available upon request to the author

Article title: Opacity of P(MMA-MAA)-PMMA Composite Latex System with Varying MAA Concentration

Authors: Gilbert U. Yu, Jerry T. Dy, and Erwin P. Enriquez

Publication title: Philippine Journal of Science 140:221-230, 2011

Abstract:

Polymer composites of core-shell morphology are commonly used in the paint industry as opacity enhancer. These are usually made of block copolymer systems wherein the core is formed from a polymer that swells in the presence of a solvent and surrounded by a high glass transition polymeric shell. Thus, upon drying, the swollen regions turn into voids while leaving a hard shell. Here, composites based on poly(methyl methacrylate-butyl acrylate) [P(MMA-BuA)] (seed stage), poly(methyl methacrylate-methacrylic acid) [P(MMA-MAA)] (second stage), and poly(methyl methacrylate) [PMMA] (third stage) were synthesized through a multistage sequential emulsion polymerization and their opacity was investigated. The second stage formulation of P(MMA-MAA) system was varied by changing the methyl methacrylate (MMA): methacrylic acid (MAA) mole composition, and the dried films of these composite latexes were characterized by infrared spectroscopy (IR), differential scanning calorimetry (DSC), and atomic force microscopy (AFM). The AFM images and ammonium hydroxide (NH₄OH) swelling studies confirmed the successful incorporation of the seed (first) stage with the second and third stage polymerization with PMMA. The differences in PMAA concentrations among the second stage polymer compositions were determined from the IR spectra and glass transition temperature (T_g) data. Investigations on the opacity and hiding power of these polymer composites were done using optical densitometry. The results show increasing absorbance, indicating increasing opacity, with increasing polymethacrylic acid (PMAA) concentration in the second stage composition.

Full text link <https://tinyurl.com/4688tjp7>

Article title: Versatile, Efficient Derivatization of Polysiloxanes via Click Technology

Authors: Ferdinand Gonzaga, Gilbert Yua and Michael A. Brook

Publication title: Chemical Communications 1730-1732, 2009

Abstract:

Copper-catalyzed (click chemistry) or thermal 1,3-dipolar cycloadditions of molecular or polymeric azido-siloxanes with a broad range of alkynes (such as amino acids or carbohydrates) easily yield new conjugates that would be otherwise difficult, if not impossible, to prepare by traditional methodologies.

Full text link available upon request to the author

Article title: Polysiloxane Elastomers via Room Temperature, Metal-Free Click Chemistry

Authors: Ferdinand Gonzaga, Gilbert Yu, and Michael A. Brook

Publication title: Macromolecules 42:9220-9224, 2009

Abstract:

No available

Full text link <https://tinyurl.com/5djz4wv3>

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**JAKOV IVAN S. DUMBRIQUE***Computer Science*

Mr. Dumbrique is one of the S&T Fellows in DOST-PCHRD. He received his Master's degree in Computer Science from the University of the Philippines Diliman. His research interests are Computer Vision applied to Medical and Healthcare Data, Deep Learning & Machine Learning, and Mathematical and Statistical Modelling

Sex: Male

Education:

Master of Science in Computer Science (ongoing), University of the Philippines-Diliman, *present*
Masters in Applied Mathematics Major in Mathematical Finance, Ateneo de Manila University, 2017

Bachelor of Science in Applied Mathematics with Specialization in Mathematical Finance, Minor in Economics, Ateneo de Manila University, 2016

Field of Specialization:

Computer Vision applied to Medical and Healthcare Data
Deep Learning & Machine Learning
Mathematical and Statistical Modelling

Researches:

Article title: Clinical evaluation of a deep learning-based model for pneumothorax detection and segmentation on chest x-ray images.

Authors: J. Dumbrique, R. Hernandez, J. Cruz, & P. Naval.

Publication title: EPOS Proceedings of the European Congress of Radiology. July 2022.

Abstract:

No available

Full text available upon request to the author

Article title: Underwater Gesture Recognition Using Classical Computer Vision and Deep Learning Techniques.

Authors: Mygel Andrei M. Martija, Jakov Ivan S. Dumbrique, and Prospero C. Naval, Jr

Publication title: EPOS Proceedings of the European Congress of Radiology, July 2022

Abstract:

Underwater Gesture Recognition is a challenging task since conditions which are normally not an issue in gesture recognition on land must be considered. Such issues include low visibility, low contrast, and unequal spectral propagation. In this work, we explore the underwater gesture recognition problem by taking on the recently released Cognitive Autonomous Diving Buddy Underwater Gestures dataset. The contributions of this paper are as follows: (1) Use traditional computer vision techniques along with classical machine learning to perform gesture recognition on the CADDY dataset; (2) Apply deep learning using a convolutional neural network to solve the same problem; (3) Perform confusion matrix analysis to determine the types of gestures that are relatively difficult to recognize and understand why; (4) Compare the performance of the methods above in terms of accuracy and inference speed. We achieve up to 97.06% accuracy with our CNN. To the best of our knowledge, our work is one of the earliest attempts, if not the first, to apply computer vision and machine learning techniques for gesture recognition on the said dataset. As such, we hope this work will serve as a benchmark for future work on the CADDY dataset.

Full text link <https://tinyurl.com/bdeyksmj>

Article title: Speech Emotion Recognition Using Support Vector Machines and Random Forests.

Authors: J. Dumbrique & L. Bautista.

Publication title: Mathematical Society of the Philippines Annual Convention. May 2019.

Abstract:

No abstract available

Full text available upon request to the author

Article title: Maternal Mortality Measurements Using National Surveys and Vital Statistics: Assessing the Quality and Content of Maternal Death Certificates.

Authors: J. De Guzman, M. Dayrit, P. Salting, A. Zosa, J. Dumbrique, & C. Dee.

Publication title: Proceedings of the 13th National Convention on Statistics. October 2016.

Abstract:

No abstract

Full text available upon request to the author

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**DR. LEOCRIS S. BATUCAN, JR***Life Sciences*

Dr. Batucan is one of the S&T Fellows of DOST. He is currently taking up his Doctorate degree in Biodiversity in National Taiwan Normal University, Taipei Taiwan.

Sex: Male

Education:

Doctor of Philosophy in Biodiversity, National Taiwan Normal University, *ongoing*
PhD Fellow - Biodiversity Research Center, Academia Sinica Taipei Taiwan, *ongoing*
Master of Science in Biology, Mindanao State University-Iligan Institute of Technology, 2016
Bachelor of Science in Biology, Mindanao State University-Iligan Institute of Technology, 2012

Field of Specialization:

Life Sciences

Researches:

Article title: Novel wing display and divergent agonistic behaviors of two incipient *Psolodesmus* damselflies

Authors: Leocris S. Batucan Jr, Yu-Hsun Hsu, Jak W. Maliszewski, Liang-Jong Wang & Chung-Ping Lin

Publication title: The Science of Nature 108 (49) 2021

Abstract:

Sexual selection via male competition is a strong evolutionary force that can drive rapid changes in competitive traits and subsequently lead to population divergence and speciation. Territorial males of many odonates are known to use their colorful wings as visual signals and to perform agonistic displays toward intruders. *Psolodesmus mandarinus dorothea* and *Psolodesmus mandarinus mandarinus* are two parapatrically distributed sister damselflies that share similar ecological characteristics but differ markedly in wing coloration. The wings of *P. m. dorothea* are mostly clear, whereas those of *P. m. mandarinus* have a large area of black pigmentation and a central white patch. We investigated whether territorial males of the two damselflies at breeding sites display distinct agonistic behaviors associated with their respective wing colors. Behavioral interactions between territorial and intruder males and their wing kinematics were filmed and analyzed for *P. m. dorothea* in Lienhuachih of central Taiwan, and *P. m. mandarinus* in Tianxiyuan and Fusan of northern Taiwan. We observed that the *P. m. mandarinus* males

exhibited a novel set of perched wing displays, which was not only absent in its sister *P. m. dorothea* but also previously unknown in Odonata. At breeding sites, perched rival males of *P. m. mandarinus* with pigmented wings exhibited escalating agonistic wing-flapping and wing-hitting displays toward each other. In contrast, territorial males of *P. m. dorothea* with clear wings engaged only in aerial chase or face-to-face hovering when intruder males approached from the air. These results indicate that the two sister *P. mandarinus* damselflies diverged behaviorally in territorial contests and support the hypothesis of coadaptation on the basis of wing colors and types of wing movement in Odonata. Our findings further suggest that divergent agonistic wing displays may play a pivotal role in the speciation mechanism of *P. mandarinus* damselflies. The sequential analyses of behavioral characteristics and progression suggest that *P. m. mandarinus* damselflies likely use mutual assessment of rivals in territorial contests.

Full text link <https://tinyurl.com/mtt98mpn>

Article title: Nutrient loadings and deforestation decrease benthic macroinvertebrate diversity in an urbanised tropical stream system

Authors: Elfritzson M.Peralta, Leocris S. Batucan Jr. Irisse Bianca B. De Jesusa, Ellis Mika C. Triño, Yoshitoshi Uehara, Takuya Ishida, Yuki Kobayashi, Chia-Ying Ko, Tomoya Iwata, Adelina S. Borja, Jonathan Carlo A. Briones, Rey Donne S. Papa, Francis S. Magbanua, Noboru Okuda

Publication title: Limnologica 80, January 2020

Abstract:

Lotic ecosystems in urban areas are severely impacted by anthropogenic environmental stressors, such as deforestation and nutrient pollution, due to socioeconomic activities in the catchment. To work out measures for identification and mitigation of concurrent multiple stressors to a stream system, it is necessary to assess the relative importance of impacts by the individual stressors. Here we aimed to discriminate the covarying effects of nutrient pollution and deforestation on benthic macroinvertebrate communities in an urbanised tropical stream system. In the Silang-Santa Rosa Subwatershed (SSRS) of Laguna de Bay, benthic macroinvertebrates and physicochemical environments were investigated at 13 sites varying in human population density, riparian canopy, and land-use pattern as indicated by geographic information systems in the catchment. Regression and multivariate analyses were performed to identify the drivers of the biodiversity loss and understand its underlying mechanisms. In the SSRS, where rapid economic growth took place without updating poorly installed wastewater treatment plants (WWTPs), domestic activity indicated by human population density in the catchment was the primary factor in generating heavy phosphorous loadings (mean total phosphorus = 0.91; range = 0–1.50 mg/l) that caused hypoxia (mean dissolved oxygen = 2.98; range = 0.13–6.27 mg/l) in stream waters and subsequently reduced macroinvertebrate diversity (mean H' = 0.91; SD \pm 0.61). Nutrient and organic pollution and riparian deforestation explained 53.5% and 9.7% of the variation of benthic macroinvertebrate communities in SSRS, respectively. Given such scenario, additional WWTPs servicing urban developments and improved riparian

canopy cover in the SSRS can be both strategic and cost-effective in the initial steps of environmental mitigation in urbanised streams, especially in rapidly developing countries.

Full text available upon request to the author

Article title: A New Species of Mayfly (Ephemeroptera: Trichorythidae) from Mindanao Island, Philippines and Association of Life Stages Using DNA Barcode

Authors: Leocris Jr. Batucan, Olga Nuneza, Reagan Joseph Villanueva, Chung-Ping Lin

Publication title: Philippine Journal of Systematic Biology 10:6-13, February 2017

Abstract:

A new mayfly species, *Sparsorythus buntawensis* sp. nov. (Trichorythidae) from Layawan River of Mt. Malindang in Mindanao Island, the Philippines is described based on nymphal and adult morphologies. *Sparsorythus buntawensis* sp. nov. differ from all known members of the genus primarily in the deeper cleft of the hypopharynx and wider distance between compound eyes. Conspecific specimens of various life stages and sexes of this new mayfly were associated using DNA barcode.

Full text available upon request to the author

Article title: Follicular hierarchy evaluation of pateros ducks (*Anas platyrhynchos domestica*) from semi free- range farms of Zamboanga del Sur and Misamis Occidental, Mindanao, Philippines

Authors: Leocris Jr. Batucan, Henry Riverero, Olga Nuneza, Bryan G D Belleza

Publication title: ABAH Bioflux, 2016, Volume 8, Issue 1, 2016

Abstract:

The egg-type pateros ducks, *Anas platyrhynchos domestica*, in the Philippines are raised in the traditional semi free-range management system which allows farmers to keep the ducks in flocks as extra activities in between their crop farming routines. This study assessed the follicular development in ducks grown from farms in semi free-range system and evaluated the different conditions of the gonads using the follicular ranks and the frequency of occurrence of follicular atresia. Nineteen ducks from Zamboanga del Sur (9 aged 6-12 months; 10 aged 13-24 months) and 20 ducks from Misamis Occidental (10 each for 6-12 and 13-24 months age group) were dissected and evaluated (n=39). Results showed that the gonadosomatic index (GSI) of 6-12 month-old ducks from Zamboanga del Sur (Group 1) was 0.367% while GSI of the 6-12 month-old ducks from Misamis Occidental (Group 2) was 0.323%. Lower GSI of 0.298% was observed for Group III (13-24 month-old ducks from Zamboanga del Sur) and Group IV with 0.222% (13-24 month-old ducks from Misamis Occidental). Results also revealed atretic, unresponsive, and undeveloped follicles in almost all of the ducks sampled which appear to be affected by the type of feeding management by the farmers.

Full text link <https://tinyurl.com/2p825ty9>

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ENRYKIE B. FORTAJADA

Botany

Mr. Fortajada is currently an S&T Fellow in DOST-NCBP. He received his master's degree in Botany minor in Molecular Biology and Biotechnology from UPLB. One of his major roles in the agency is to provide his expertise in the conducting risk assessment of biosafety applications for the use of GMOs. This is to ensure that the best available science is being utilized to protect the environment and human health, at the same time reap the maximum benefits of modern biotechnology to help our farmers and the community.

Sex: Male

Education:

Master of Science in Botany minor in Molecular Biology and Biotechnology, University of the Philippines Los Baños, 2018

Bachelor of Science in Biology, Polytechnic University of the Philippines, 20213

Field of Specialization:

Plant physiology

Plant systematics

Molecular biology

Researches:

Article title: Incorporating Animal Forensics in Routine Meat Inspection in the Philippines

Authors: Enrykie B. Fortajada, Ian Kendrick C. Fontanilla, Maria Corazon A. De Ungria

Publication title: Forensic Science International: Animals and Environments, 1, 2021

Abstract:

Robust species identification of unprocessed and processed meat is essential to ensure the safety and quality of food products. Meat adulteration results from the wrong identification of animal sources, contamination of different meats during processing, or intentional meat substitution using those from other species and non-meat products of lower economic value. This review discusses the potential applications of DNA barcoding in routine meat inspections in the Philippines. Developing mini-barcode primer sets to enhance the utility of conventional techniques is critical in adopting DNA barcoding technology as a robust tool for routine inspections of meat sold commercially, including those intended for the halal meat industry. Increasing the ability of the Philippine National Meat Inspection Service to document the number, types, and scope of meat fraud is a step forward in finally using animal forensic science as a valuable component of its regulatory functions for the protection of the meat-consuming public.

Full text available upon request to the author

Article title: Altitudinal Variations of Essential Oil-Secreting Tube Cells in the Vegetative Organs of *Coriandrum sativum* L.

Authors: Altitudinal Variations of Essential Oil-Secreting Tube Cells in the Vegetative Organs of *Coriandrum sativum* L.

Publication title: International Journal of Biosciences, February 2018

Abstract:

Modifications in the anatomical structure of plants grown in different conditions have been reported, such as increase in number of palisade mesophyll layers, size and density of stomata. However, these variable responses to environmental factors depend on the physiological and morphological characteristics of the species. In this study, anatomical features on the vegetative organs of *Coriandrum sativum* L. from two areas with different elevations were evaluated with emphasis on essential oil-secreting tube cells (EOT). Light microscopy techniques were employed in examining the transverse sections of roots, stems, and leaves. Anatomically, the *C. sativum* roots, stems, and leaves had the same tissue compositions in both sampled areas. However, the diameter of EOT significantly differed in between two areas. Cross sections of *C. sativum* from La Trinidad, Benguet which represented the area with higher elevation had significantly larger diameter of EOT in all sampled vegetative organs. In both areas, EOT were localized in the cortical region of the roots, below the hypodermal area of the stem and adjacent to its vascular bundles, and within the spongy parenchyma layer of leaves. In roots, EOT cells were randomly arranged within the cortical region, in a ring-pattern in stems following the vascular bundle arrangement, and adjacent to vascular bundles in leaves.

Full text available upon request to the author

Article title: Growth and Yield Responses of Rice (*Oryza sativa* L.) Genotypes Contrasting in Flooding Tolerance under Partial and Complete Submergence

Authors: Enrykie B. Fortajada

Publication title: Not stated

Abstract:

No available

Full text available upon request to the author

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**MARK GINO E. ALIPERIO***Physics, Power Plan Engineering*

Mr. Aliperio is one of the S&T Fellows in DOST-PNRI. He received his two master's degree; Physics from Mindanao State University-Iligan Institute of Technology; and Nuclear Power Plant Engineering from KEPCO International Nuclear Graduate School. His research interest is Nuclear Energy.

Sex: Male

Education:

Master of Science in Nuclear Power Plant Engineering, KEPCO International Nuclear Graduate School, 2019

Master of Science in Physics, Mindanao State University - Iligan Institute of Technology, 2014

Bachelor of Science in Physics, Mindanao State University - Iligan Institute of Technology, 2011

Field of Specialization:

Nuclear Energy

Construction

Project Management

Physics

Researches:

Article title: Selection of appropriate generation iv nuclear reactor development: a systems engineering approach

Authors: Mark Giono and Eric Yee

Publication title: Journal of the Korea Management Engineers Society 24(2): 109-132, 2019

Abstract:

In 2012, The Generation IV International Forum (GIF) (then representing 10 countries) selected six (6) reactor technologies to be further developed on the basis of being safe, sustainable, cost-effective, and resistant to weapons proliferation. Nowadays, there are several designs of Gen IV nuclear power plants (NPP) but few will be deployed due to strategic, economic, and even political reasons. Such factors posed a challenge in selecting an ideal Gen IV technology to be implemented. In this paper, selection criteria for implementing an appropriate Gen IV NPP program is developed for use in a systems engineering approach for decision making. In this paper, some selection criteria for implementing Gen IV technology is developed. It involves three goal areas with 10 goals and 25 criteria under them. It is important to note that metrics and the corresponding weight factors for each criteria has not been set due to its subjective nature

and will be based on technology experts' determination or a country's suitable need for such nuclear systems.

Full text available upon request to the author

Article title: Development of polytetrafluoroethylene superhydrophobic surface with patterned micro-roughness morphology

Authors: J.C. Mercado, K.K. Nalaunan, C.G. Corpuz, M.G. Aliperio

Publication title: Proceedings of the 18th SPVM National Physics Conference, p. 157, 2016

Abstract:

No available

Full text available upon request to the author

Article title: One-dimensional collective motion of chemically driven self-propelling boats in a channel

Authors: M.G. Aliperio and M.N. Confesor

Publication title: Proceedings of the International Scientific Meeting on Complex Systems, p. 101, 2016

Abstract:

No available

Full text available upon request to the author

Article title: Surface viscosity effects on the dynamics and trajectory of self-propelling boats

Authors: M G Aliperio and Mark Nolan Confesor

Publication title: OP Conference Series: Materials Science and Engineering, 79:5-12, 2016

Abstract:

Self-propelled droplets have been conceived as simple chemical toy models to mimic motile biological samples such as bacteria. The motion of these droplets is believed to be due to the surface tension gradient in the boundary of the droplet. We performed experiments to look at the effect of varying the medium viscosity to the speed of a circular boat that was soaked in Pentanol. We found that the boats undergo oscillatory type of motion inside a channel. Moreover we found the maximum speed of the boat is independent on the viscosity of the medium. On the other a time scale describing the width of the velocity profile of the boat was found to increase with increasing viscosity.

Full text available upon request to the author

Article title: Development and Analysis of Fabricated Superhydrophobic Surfaces with Controlled Micro-roughness Morphology

Authors: M.G. Aliperio and R.B. Balili

Publication title: Book of Abstracts of the Baku World Forum of Young Scientists 2014, p 91 – 92 (2014)

Abstract:

No available

Full text available upon request to the author

Article title: Surface Viscosity Effects on the One-dimensional Motion of Self-propelling Boats

Authors: M G Aliperio and Mark Nolan Confesor

Publication title: IOP Conf. Series: Materials Science and Engineering 79: 012002, 2015

Abstract

Self-propelled droplets have been conceived as simple chemical toy models to mimic motile biological samples such as bacteria. The motion of these droplets is believed to be due to the surface tension gradient in the boundary of the droplet. We performed experiments to look at the effect of varying the medium viscosity to the speed of a circular boat that was soaked in Pentanol. We found that the boats undergo oscillatory type of motion inside a channel. Moreover we found the maximum speed of the boat is independent on the viscosity of the medium. On the other a time scale describing the width of the velocity profile of the boat was found to increase with increasing viscosity.

Full text link <https://tinyurl.com/25rftzc5>

Article title: Development of Superhydrophobic Surfaces with Controlled Micro-roughness Morphology

Authors: M.G. Aliperio, W.N. Membreve, R.B. Balili

Publication title: Proceedings of the 13th SPVM National Physics Conference, p 11, 2011

Abstract

No available

Full text available upon request to the author

Article title: Quantifying Superhydrophobicity of Unstructured Surfaces

Authors: M.G. Aliperio, W.N. Membreve, R.B. Balili

Publication title: Proceedings of the 12th SPVM National Physics Conference, p 101 – 103, 2010

Abstract

No available

Full text available upon request to the author

Article title: Determination of Contact Angle through Fitting

Authors: W.N. Membreve, M.G. Aliperio, R.B. Balili

Publication title: Proceedings of the 12th SPVM National Physics Conference, p 169, 2010

Abstract

No available

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DR. JUSTINE PERRY T. DOMINGO

Geochemistry

Dr. Domingo is currently an S&T Fellow in DOST-PNRI. He received his PhD in Atmospheric and Environmental Sciences at the University of Edinburgh in Scotland. He worked as a Research Associate in the Environment Monitoring Laboratory of UP-NIGS. He was in multiple projects involving hydrologic baseline studies, sediment flux studies, water quality assessment, geohazard mapping, and river profiling.

Sex: Male

Education:

Doctor of Philosophy in Atmospheric and Environmental Sciences, University of Edinburgh, Scotland, 2022

Master of Science in Geology, University of the Philippines Diliman, 2015

Bachelor of Science in Biology, University of the Philippines Diliman, 2010

Field of Specialization:

Geochemistry

Researches:

Article title: Seasonal fluxes and sediment routing in tropical catchments affected by nickel mining.

Authors: Justine Perry T. Domingo, Mikaël Attal, Simon M. Mudd, Bryne T. Ngwenya, Carlos Primo C. David

Publication title: Earth Surface Processes and Landforms, 2021

Abstract

An important gap in the management of land erosion in mining-affected areas is the understanding of the entire sediment routing system and the links between sources and storage at the catchment scale. In this study, we examine sediment delivery and its seasonality in the nickel mining-affected Santa Cruz and Pamalabawan catchments in the Philippines. We monitored discharge, suspended sediment concentrations and suspended sediment loads across 13 sub-catchments with contrasting degrees of mining influence from June 2018 to July 2019. First, we show the importance of the size of the area that has been physically disturbed within our sub-catchments, with as little as 10–22% of relative disturbance area being enough to generate four-fold to eight-fold increase in the sediment yield relative to less disturbed and pristine areas. We found that sub-catchments with > 10% disturbance exhibit the highest sediment yields ($15.5 \pm 44.7 \text{ t km}^{-2} \text{ d}^{-1}$) compared with sub-catchments with < 10% disturbance ($3.6 \pm 17.7 \text{ t km}^{-2} \text{ d}^{-1}$) and undisturbed catchments ($2.0 \pm 5.7 \text{ t km}^{-2} \text{ d}^{-1}$). We also show that

sediment flushing predominantly occurs in the most disturbed sub-catchments at the onset of the wet season. A small number of flood events transports the bulk of the sediment, with hysteresis effects being most pronounced in disturbed areas. Lastly, we show that floodplain sediment recycling exerts a key control on sediment delivery at both reach and catchment scales, with the relative contribution of floodplain sources to the sediment budget becoming dominant in the latter stages of the wet season- up to 89% of the total sediment export per storm event. This study highlights the importance of both degree of disturbance and sediment pathways in controlling sediment transport in mining-disturbed areas, and that considering the entire sediment routing system including intermediate stores is crucial to optimizing existing and future measures against siltation and potential contamination of trace metals and metalloids downstream of mining areas.

Full text link <https://tinyurl.com/2yp9myb7>

Article title: Siltation load contribution of nickel laterite mining on the coastal water quality of Hinadkaban Bay, Surigao Provinces, Philippines.

Authors: D C Apodaca, J P T Domingo, C P C. David and S D David Jr.

Publication title: IOP Conference Series: Earth and Environmental Science 191, 2018

Abstract

Satellite images of Hinadkaban Bay, in Surigao Provinces, Philippines have indicated quite extensive siltation. Apparently, hilltop mining operations and other anthropogenic activities have resulted to deposition of suspended solids into the stretch of Hinadkaban Bay. In this regard, a multidisciplinary team was dispensed to undertake study in line with determining the environmental conditions along Hinadkaban Bay. Coastal marine water samples and surface water samples were obtained in two separate occasions (March and October 2012) via grab sampling. It was found that soil erosion in the study area was exacerbated by mining operations, road constructions and other anthropogenic activities, with heavy siltation often observed in areas near causeways, stockyards or siltation ponds of mine companies. Mean total suspended solids data of 5.87 mg/L was obtained for samples collected during the dry season while as high as 1000 mg/L TSS was recorded during heavy runoff. Meanwhile, average concentration of total nickel in water samples ranged from 0.050 µg/mL during dry season to 0.25 µg/mL during wet season. On the other hand mean total chromium concentration ranged from 0.060 µg/mL (dry season) to 0.30 µg/mL (wet season). Results of this study shall contribute to the effort of protecting surface water resources and of optimizing their beneficial uses.

Full text available upon request to the author

Article title: Soil amelioration potential of legumes for mine tailings.

Authors: Justine Perry T. Domingo and Carlos Primo C. David

Publication title: Philippine Journal of Science 143(1): 1-8, June 2014

Abstract

Substrate fertility is an important constraint in the revegetation of active mining and mined out areas. In particular, the physical and chemical properties of tailings materials preclude any sustainable vegetation cover; more so if the usual practice of planting tree seedlings are used. Focus should first be given to transforming the tailings material into a more viable material for plant growth. This research tested the potential of two legume species, *Centrosema molle* and *Calopogonium mucunoides*, in the transformation of the tailings material and in the establishment of vegetation. Improvement in the levels of phosphorus and organic matter was observed in the legume-planted material after 4 months, while heavy metals including copper, arsenic, and cadmium have undergone significant reduction. Results suggest that these species could be effectively used to improve the soil conditions in abandoned mine areas and tailings dumps.

Full text link <https://tinyurl.com/56hjsx47s>

Article title: Geochemical Characterization of Copper Tailings after Legume Revegetation

Authors: Justine Perry T. Domingo and Carlos Primo C. David

Publication title: Science Diliman 26:2, 61-71, 2014

Abstract

Knowledge on the geochemistry of mine tailings is important in understanding the challenges in establishing vegetation cover on tailings dumps and mined out areas. In this study, the mineralogy and trace element composition of copper tailings were examined. Two legume species, *Calopogonium mucunoides* and *Centrosema molle*, were utilized to investigate the possible effects of these plants in the geochemical development of mine tailings into soil-like material. The initial mineralogical and chemical analysis of the tailings samples indicated poor conditions for plant growth—minimal levels of major nutrients and organic matter as well as elevated copper concentrations. Despite these conditions, the two legume species exhibited good growth rates. Both legumes have likewise significantly reduced heavy metal concentrations in the tailings, indicating the possibility of metal hyperaccumulation in the plant tissue. The mineral composition has been retained even after revegetation; nevertheless, breakdown of primary minerals and subsequent formation of clay minerals were detected. These results provide insights on the transformation of toxic materials into habitable substrates for sustained plant growth.

Full text available upon request to the author

Article title: Legume and Grass Revegetation of Mine Tailings.

Authors: Justine Perry T. Domingo and Carlos Primo C. David

Publication title: Life-of- Mine 2014 Conference Proceedings. The Australasian Institute of Mining and Metallurgy, Brisbane, Queensland, Australia, pp. 525-533, 2014

Abstract

Addressing nutrient deficiency, among other factors, is vital to the growth and establishment of plants in mine spoils and tailings ponds. Although several organic amendments are available

for this purpose, it is important to determine the appropriate ameliorant for the selected plant species. This research examined the effect of different amendments on the growth and ground cover of *Centrosema molle*, *Calopogonium mucunoides* and *Sorghum spp.*

in copper/gold tailings. Plant growth and ground cover drastically increased with the application of organic ameliorants, especially manure. Among the three plants, *Calopogonium* exhibited the best growth and has shown its capability to establish a dense ground cover even in unamended tailings. Results suggest that the plant species and the ameliorants used in this study could be effective in a low-input approach to mine rehabilitation. CITATION: Domingo, J P T and David, C P C, 2014. Legume and grass revegetation of mine tailings, in *Proceedings Life-of-Mine 2014* , pp 525-534 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Full text available upon request to the author

Contact details: jusdomingo@gmail.com

**DR. ALBERT REMUS R. ROSANA***Chemistry*

Dr. Albert Remus R. Rosana is recognized for his contribution in the field of Chemistry. Currently, he is a Science and Technology Fellow from DOST-Philippine Council for Health and Research Development (PCHRD) under the Tuklas Lunas (Drug Discovery and Development) Program. Dr. Rosana is known for his study on the bacteria, *Streptomyces* sp. AI-08, from Mt. Mayon soils that may have antibiotic and anticancer properties.

Sex: Male**Education:**

Doctor of Philosophy in Chemistry (Chemical Biology), University of Alberta, Canada 2021

Master of Science in Microbiology and Biotechnology, University of Alberta, Canada, 2013

Bachelor of Science in Biology, University of the Philippines Los Baños, 2005

Field of Specialization

Microbiology

Chemical Biology

Biotechnology

Researches:

Article title: Screening, characterization, and isolation of pigments from bacteria in mesophotic depths of the Benham Bank Seamount, Philippine Rise Region.

Authors: Christopher G. Batbatan, Albert Remus R. Rosana, Kleinberg X. Fernandez, Saul M. Rojas, Hildie Maria E. Nacorda, Asuncion K. Raymundo, and Nacita B. Lantican

Publication title: Philippine Journal of Science 151(2): 615-641, April 2022

Abstract:

The exploration for pigment-producing bacteria and structurally novel pigment continues to increase, and the marine environment has recently become an attractive research site for these investigations because of its rich yet untapped biodiversity. In this study, 16S rRNA gene sequencing and HPLC (high-performance liquid chromatography) profiling of the microbial pigments produced by marine heterotrophic bacteria were described. Seven phenotypically distinct isolates of marine pigmented heterotrophic bacteria (MPHB) were isolated from near-bottom waters and coral reef sediments at mesophotic depths of the Benham Bank Seamount – namely, isolates BR14, BR61, BR63, BR100, BR101, BR144, and BR146. Four promising isolates were subjected to 16S rRNA gene sequencing and revealed that strains BR61 and BR100 were related to members of the genus *Cytobacillus*, whereas isolates BR144 and BR146 clustered with *Meridianimaribacter flavus* and *Pseudoalteromonas rubra*, respectively.

Growth of the seven isolates on three media – natural sea water (NSW) Reasoner's 2A (R2A), marine agar (MA), and tryptic soy agar – revealed variable pigment production and growth yield. MA appeared to be a superior substrate, resulting in darker pigmentation and higher biomass yield. Through a liquid-liquid partitioning approach, isolates BR14 and BR100 produced pigments that were acetone-soluble, whereas isolates BR101, BR144, and BR146 are hexane soluble. Moreover, the BR146 red pigment was proposed to be a mixture of putative prodiginine analogs. The putative prodiginines produced by isolate BR146 can stain fabrics, supporting a proof-of-concept that marine bacteria can be utilized as fabric colorants. The data presented here provided new insights into the utilization of local Philippine marine microbial resources for natural marine pigments with industrial applications.

Full text link <https://tinyurl.com/mt24crj8>

Article title: Methylene Analogues of Neopetrosiamide as Potential Antimetastatic Agents: Solid-Supported Syntheses Using Diamino Diacids for Pre-Stapling of Peptides with Multiple Disulfides

Authors: Cameron A. Pascoe, Daniel B. Engelhardt, Albert Remus R. Rosana, Marco J. van Belkum, and John C. Vederas

Publication title: Organic Letters (23):9216-9220, 2021

Abstract:

Neopetrosiamide, a 28-residue peptide from Neopetrosia sp., contains three disulfide bonds and hinders mammalian tumor cell invasion. Proper connectivity of disulfide bonds is crucial for activity. Synthetic replacement of single disulfide bridges with methylene bridges gives active analogues. Pre-stapling of one ring enhances the correct formation of the remaining disulfides by reducing isomeric possibilities and possibly initiating the correct 3D fold. Cloning and expression of neopetrosiamide in E. coli affords access to the natural linear peptide.

Full text available upon request to the author

Article title: Genomic insights into the antimicrobial and anticancer potential of Streptomyces isolated from volcanic soils of Mount Mayon, Philippines.

Authors: Kristel Mae P. Oliveros, Albert Remus R. Rosana, Andrew D. Montecillo, Rina B. Opulencia, Arian J. Jacildo, Teofila O. Zulaybar, and Asuncion K. Raymundo

Publication title: Philippine Journal of Science 150(6A):1351-1377, December 2021

Abstract:

Antimicrobial resistance (AMR) poses a global and developmental threat to humanity. The rapid emergence and spread of drug-resistant pathogens resulted in the ineffective use of currently available antibiotics. Therefore, there is a need to continue searching for additional sources of antibiotics, such as actinomycetes, which can potentially harbor unique and effective secondary metabolites. Furthermore, it is interesting to consider poorly explored environments like volcanoes, which can be potential sources of drug leads for medically important natural products. This study reports the antimicrobial activity of actinomycetes isolated from volcanic

soil samples collected from Mount Mayon, Albay, Philippines. A total of 13 out of 30 morphologically distinct actinomycete isolates showed antagonistic activity against test microorganisms. Isolate A1-08, the focus of the study, exhibited a wide spectrum of antimicrobial activity against *Salmonella enterica*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), *Candida albicans*, *Aspergillus niger*, and *Fusarium* sp. Moreover, A1-08 was found to have anti-methicillin resistant *S. aureus* (MIC = 2.50 mg/mL) and anticancer activity against human colorectal cancer (HCT116) cell line (IC₅₀ = 21.54 µg/mL). Whole-genome sequence-based phylogenetic analysis supported a novel species of *Streptomyces* closely related to *S. olivaceus* NRRL B-3009. A total of 48 biosynthetic gene clusters (BGCs) were identified that may be responsible for the biosynthesis of known and potentially novel secondary metabolites. This study concludes that *Streptomyces* sp. A1-08, a potentially novel species, is a good candidate to produce broad-spectrum antibiotics with anti-MRSA and anti-cancer activities and possibly novel secondary bioactive metabolites of medical and pharmaceutical importance.

Full text link <https://tinyurl.com/yc8ft4a>

Article title: Selection of entomopathogenic fungus *Beauveria bassiana* (Deuteromycotina: Hyphomycetes) for the biocontrol of *Dendroctonus ponderosae* (Coleoptera: Curculionidae, Scolytinae) in Western Canada.

Authors: Albert Remus R. Rosana, Stanley Pokorny, Jennifer G. Klutsch, Cherry Ibarra-Romero, Randy Sanichar, Daniel Engelhardt, Marco J. van Belkum, Nadir Erbilgin, Joerg Bohlmann, Allan L. Carroll & John C. Vederas

Publication title: Applied Microbiology and Biotechnology (105):2541-2557, 2021

Abstract:

The mountain pine beetle, *Dendroctonus ponderosae*, has infested over ~16 Mha of pine forests in British Columbia killing >50% of mature lodgepole pine, *Pinus contorta*, trees in affected stands. At present, it is functionally an invasive species in Alberta, killing and reproducing in evolutionarily naïve populations of lodgepole pine (*P. contorta*), novel jack pine (*P. banksiana*), and their hybrids. The entomopathogenic fungus *Beauveria bassiana* has shown some potential as a biocontrol agent of several bark beetle species. In this study, nine isolates of *B. bassiana* were examined for insect virulence characteristics, including conidiation rate, pigmentation, and infection rate in laboratory-reared *D. ponderosae*, to assess for their potential as biocontrol agents. The strains were categorized into three phenotypic groups based on pigmentation, conidial density, and myceliation rate. Virulence screening utilizing insect-based agar medium (*D. ponderosae* and European honeybee *Apis mellifera* carcasses) revealed no difference in selection of fungal growth. However, infection studies on *D. ponderosae* and *A. mellifera* showed contrasting results. In vivo *A. mellifera* infection model revealed ~5% mortality, representing the natural death rate of the hive population, whereas laboratory-reared *D. ponderosae* showed 100% mortality and mycosis. The LT₅₀ (median lethal time 50) ranges from 2 to 5 ± 0.33 days, and LT₁₀₀ ranges from 4 to 6 ± 0.5 days. We discuss the selective advantages of the three phenotypic groups in terms of virulence, pigmentation, conidial abundance, and

tolerance to abiotic factors like UV and host tree monoterpenes. These results can further provide insights into the development of several phenotypically diverse *B. bassiana* strains in controlling the spread of the invasive *D. ponderosae* in Western Canada.

Full text available upon request to the author

Article title: Draft genome sequence of the phosphate-solubilizing rhizobacterium *Burkholderia pseudomultivorans* strain MPSB1, isolated from a copper mined-out site.

Authors: Berna Lou L. Aba-Regis, Kristel Mae P. Oliveros, Cherry Ibarra-Romero, Asuncion K. Raymundo, Nelly S. Aggangan, Teofila O. Zulaybar, Albert Remus R. Rosana

Publication title: Microbiology Resource Announcements 10(1): e01304-20, 2021

Abstract:

Burkholderia pseudomultivorans MPSB1 was isolated from a copper mined-out soil sample collected from Mogpog, Marinduque, Philippines. Here, we report the draft genome sequence with predicted gene inventories supporting rhizosphere bioremediation, such as heavy metal tolerance, phosphate solubilization, and siderophore production.

Full text available upon request to the author

Article title: RNA helicase-regulated processing of the *Synechocystis* rimO-crhR operon results in differential cistron expression and accumulation of two sRNAs

Authors: Albert Remus R. Rosana, Denise S. Whitford, Anzhela Migur, Claudia Steglich, Sonya L. Kujat-Choy, Wolfgang R. Hess, George W. Owtrim

Publication title: The Journal of Biochemistry 295(19):6372-6386, May 2020

Abstract:

The arrangement of functionally-related genes in operons is a fundamental element of how genetic information is organized in prokaryotes. This organization ensures coordinated gene expression by co-transcription. Often, however, alternative genetic responses to specific stress conditions demand the discoordination of operon expression. During cold temperature stress, accumulation of the gene encoding the sole Asp-Glu-Ala-Asp (DEAD)-box RNA helicase in *Synechocystis* sp. PCC 6803, crhR (slr0083), increases 15-fold. Here, we show that crhR is expressed from a dicistronic operon with the methylthiotransferase rimO/miaB (slr0082) gene, followed by rapid processing of the operon transcript into two monocistronic mRNAs. This cleavage event is required for and results in destabilization of the rimO transcript. Results from secondary structure modeling and analysis of RNase E cleavage of the rimO-crhR transcript in vitro suggested that CrhR plays a role in enhancing the rate of the processing in an auto-regulatory manner. Moreover, two putative small RNAs are generated from additional processing, degradation, or both of the rimO transcript. These results suggest a role for the bacterial RNA helicase CrhR in RNase E-dependent mRNA processing in *Synechocystis* and expand the known range of organisms possessing small RNAs derived from processing of mRNA transcripts.

Full text available upon request to the author

Article title: Draft Genome Sequence of the Thermophilic Bacterium *Bacillus licheniformis* SMIA-2, an Antimicrobial- and Thermostable Enzyme-Producing Isolate from Brazilian Soil

Authors: Samara Pinto Custodio Bernardo, Albert Remus R. Rosana, Adriane Nunes de Souza, Sorina Chiorean, Meire Lelis Leal Martins, John C. Vederas

Publication title: Microbiology Resource Announcements 9(17): e00106-20, 2020

Abstract:

Bacillus licheniformis SMIA-2, a thermophilic and thermostable enzyme-producing bacterium, is found to be active against several strains of *Staphylococcus aureus* and several *Bacillus* species. Here, we report the 4.30-Mbp draft genome and bioinformatic predictions supporting gene inventories for amylase, protease, cellulase, xylanase, and antimicrobial compound biosynthesis.

Full text available upon request to the author

Article title: Isolation and characterization of *Serratia marcescens* bacteriophages from sewage water.

Authors: Rakesh Coleen Dacayo, Albert Remus R. Rosana, and Lucille C. Villegas

Publication title: Journal of Nature Studies 18(2): 92-107, 2019

Abstract:

Serratia marcescens has been recognized as an opportunistic nosocomial pathogen. The emergence of multidrug-resistant *S. marcescens* strains, which pose threats to public health, prompts actions to control their growth and dissemination. One of the leading control strategies which has the potential to be used as either an alternative or a supplement to antibiotic treatment is phage therapy. This study was performed to isolate bacteriophages that can be used against *S. marcescens*, and characterize the isolated phages based on lytic activity and particle morphology. The bacteriophages were obtained from raw sewage through phage enrichment followed by double agar overlay plaque assay. Plaques exhibiting varying morphologies were isolated and purified. Phage isolates designated as P1, P2, P3 and P4 formed turbid plaques while phage P5 formed clear circular plaques surrounded by a large halo. Assessment of the lytic activity of the phages showed that the *S. marcescens* wild type and seven *S. marcescens* Tn5-insertional mutants were susceptible to the five phage isolates. Phages P1, P2 and P3 were able to infect *Escherichia coli* while only phage P4 was able to infect *Salmonella enterica* subsp. *enterica*. Unrelated genera which included *Bacillus megaterium*, *B. subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Micrococcus luteus* were not susceptible to all the phages. Based on the virion size and morphology as revealed by electron microscopic analysis, the possible identity of the phage isolates was deduced following the classification scheme of the International Committee on Taxonomy of Viruses. The five phages may belong to Order

Caudovirales. Phages P1 and P2 having icosahedral-isometric heads with thin, long, noncontractile, flexible tail, may belong to Family Siphoviridae. Phage P3 has icosahedral-isometric head with no visible tail which may indicate that it belongs to Family Podoviridae. Phage P5 possesses an icosahedral-isometric head with a neck that is connected to a rigid contractile tail, which may classify it under Family Myoviridae. The results of this study suggest the possible use of the phages as bactericidal agents. Further characterization of the identified phages can be done to fully understand their potential application as biocontrol agents against *S. marcescens*.

Full text link <https://tinyurl.com/4rsp95yt>

Article title: Draft Genome Sequences of Six Bacteria Isolated from the Benham Bank, Philippine Rise, Philippines

Authors: Saul M. Rojas, Albert Remus R. Rosana, Andrew D. Montecillo, Mark Dondi M. Arboleda, Hildie Maria E. Nacorda, Nacita B. Lantican

Publication title: Microbiology Resource Announcements 8(29): e00777-19, 2019

Abstract:

We report here the draft genome sequences of six bacteria isolated from the near-bottom waters and surface sediments of the Benham Bank, Philippine Rise, Philippines. These genome sequences represent candidate novel species and/or strains from the families Flavobacteriaceae and Dermacoccaceae and the genera *Idiomarina*, *Bacillus*, and *Vibrio*.

Full text available upon request to the author

Article title: Draft Genome Sequence of *Enterobacter* sp. Strain AD2-3, Isolated from a Postmining Site in Benguet, Philippines

Authors: Jocelyn T. Zarate, Genevieve Mae B. Aquino, Joana Marie C. Cruz, Neilyn O. Villa, and Albert Remus R. Rosana

Publication title: Microbiology Resource Announcements 8(30): e00563-19, 2019

Abstract:

The novel strain *Enterobacter* sp. strain AD2-3 was isolated from postmining soil samples collected from Antamok mine in Benguet, Philippines. Here, we report a draft of its whole-genome sequence, with predicted gene inventories supporting metal tolerance, nitrogen fixation, phosphate solubilization, and indole acetic acid production.

Full text available upon request to the author

Article title: Herbs and spices: Biomarkers of intake based on human intervention studies
- A systematic review

Authors: Rosa Vázquez-Fresno, Albert Remus R. Rosana, Tanvir Sajed, Tuviera Onookome-Okome, Noah A. Wishart, David S. Wishart

Publication title: Genes Nutrition 14:1-27, May 2019

Abstract:

Culinary herbs and spices have been used as both food flavoring and food preservative agents for centuries. Moreover, due to their known and presumptive health benefits, herbs and spices have also been used in medical practices since ancient times. Some of the health effects attributed to herbs and spices include antioxidant, anti-microbial, and anti-inflammatory effects as well as potential protection against cardiovascular disease, neurodegeneration, type 2 diabetes, and cancer. While interest in herbs and spices as medicinal agents remains high and their use in foods continues to grow, there have been remarkably few studies that have attempted to track the dietary intake of herbs and spices and even fewer that have tried to find potential biomarkers of food intake (BFIs). The aim of the present review is to systematically survey the global literature on herbs and spices in an effort to identify and evaluate specific intake biomarkers for a representative set of common herbs and spices in humans. A total of 25 herbs and spices were initially chosen, including anise, basil, black pepper, caraway, chili pepper, cinnamon, clove, cumin, curcumin, dill, fennel, fenugreek, ginger, lemongrass, marjoram, nutmeg, oregano, parsley, peppermint and spearmint, rosemary, saffron, sage, tarragon, and thyme. However, only 17 of these herbs and spices had published, peer-reviewed studies describing potential biomarkers of intake. In many studies, the herb or spice of interest was administered in the form of a capsule or extract and very few studies were performed with actual foods. A systematic assessment of the candidate biomarkers was also performed. Given the limitations in the experimental designs for many of the published studies, further work is needed to better evaluate the identified set of BFIs. Although the daily intake of herbs and spices is very low compared to most other foods, this important set of food seasoning agents should not be underestimated, especially given their potential benefits to human health.

Full text available upon request to the author

Article title: Inactivation of the RNA helicase CrhR impacts a specific subset of the transcriptome in the cyanobacterium *Synechocystis* sp. PCC 6803.

Authors: Jens Georg, Albert Remus R. Rosana, Danuta Chamot, Anzhela Migur, Wolfgang R. Hess, George W. Owtrim

Publication title: RNA biology 16(9): 1205-1214, September 2019

Abstract:

DEAD-box RNA-helicases catalyze the reorganization of structured RNAs and the formation of RNP complexes. The cyanobacterium *Synechocystis* sp. PCC 6803 encodes a single DEAD-box RNA helicase, CrhR (Slr0083), whose expression is regulated by abiotic stresses that alter the redox potential of the photosynthetic electron transport chain, including temperature downshift. Despite its proposed effect on RNA metabolism and its known relevance in cold-stress adaptation, the reported impact of a CrhR knockout on the cold adaption of the transcriptome only identified eight affected genes. Here, we utilized a custom designed microarray to assess the impact of the absence of CrhR RNA helicase activity on the transcriptome, independent of cold stress. CrhR truncation impacts an RNA subset comprising ~10% of the ncRNA and also ~10% of the mRNA transcripts. While equal numbers of mRNAs showed increased as well as decreased abundance, more than 90% of the ncRNAs showed

enhanced expression in the absence of CrhR, indicative of a negative effect on ncRNA transcription or stability. We further tested the effect of CrhR on the stability of strongly responding RNAs that identify examples of post-transcriptional and transcriptional regulation. The data suggest that CrhR impacts multiple aspects of RNA metabolism in *Synechocystis*.

Full text available upon request to the author

Article title: Genomic insights into the draft genome sequence of *Bacillus thuringiensis* DNG9 isolated from Algerian soil-oil slough.

Authors: Mohamed Seghir Daas, Albert Remus R. Rosana, Jeella Z Acedo, Malika Douzane, Farida Nateche, Salima Kebbouche-Gana, John C Vederas

Publication title: Standards in genomic sciences 13:1-25, October 2018

Abstract:

Bacillus thuringiensis is widely used as a bioinsecticide due to its ability to form parasporal crystals containing proteinaceous toxins. It is a member of the *Bacillus cereus* sensu lato, a group with low genetic diversity but produces several promising antimicrobial compounds. *B. thuringiensis* DNG9, isolated from an oil-contaminated slough in Algeria, has strong antibacterial, antifungal and biosurfactant properties. Here, we report the 6.06 Mbp draft genome sequence of *B. thuringiensis* DNG9. The genome encodes several gene inventories for the biosynthesis of bioactive compounds such as zwittermycin A, petrobactin, insecticidal toxins, polyhydroxyalkanoates and multiple bacteriocins. We expect the genome information of strain DNG9 will provide another model system to study pathogenicity against insect pests, plant diseases, and antimicrobial compound mining and comparative phylogenesis among the *Bacillus cereus* sensu lato group.

Full text available upon request to the author

Article title: Biomarker of food intake for assessing the consumption of dairy and egg products

Authors: Linda H Münger, Mar Garcia-Aloy, Rosa Vázquez-Fresno, Doreen Gille, Albert Remus R. Rosana, Anna Passerini, María-Trinidad Soria-Florido, Grégory Pimentel, Tanvir Sajed, David S. Wishart, Cristina Andres Lacueva, Guy Vergères, and Giulia Praticò

Publication title: Genes & nutrition 13: 1-18, 2018

Abstract:

Dairy and egg products constitute an important part of Western diets as they represent an excellent source of high-quality proteins, vitamins, minerals and fats. Dairy and egg products are highly diverse and their associations with a range of nutritional and health outcomes are therefore heterogeneous. Such associations are also often weak or debated due to the difficulty in establishing correct assessments of dietary intake. Therefore, in order to better characterize associations between the consumption of these foods and health outcomes, it is important to identify reliable biomarkers of their intake. Biomarkers of food intake (BFIs) provide an accurate measure of intake, which is independent of the memory and sincerity of the subjects as well as of their knowledge about the consumed foods. We have, therefore, conducted a systematic

search of the scientific literature to evaluate the current status of potential BFIs for dairy products and BFIs for egg products commonly consumed in Europe. Strikingly, only a limited number of compounds have been reported as markers for the intake of these products and none of them have been sufficiently validated. A series of challenges hinders the identification and validation of BFI for dairy and egg products, in particular, the heterogeneous composition of these foods and the lack of specificity of the markers identified so far. Further studies are, therefore, necessary to validate these compounds and to discover new candidate BFIs. Untargeted metabolomic strategies may allow the identification of novel biomarkers, which, when taken separately or in combination, could be used to assess the intake of dairy and egg products.

Full text available upon request to the author

Article title: Near-complete genome sequence of *Ralstonia solanacearum* T523 a phylotype I tomato phytopathogen isolated from the Philippines.

Authors: Andrew D. Montecillo, Asuncion K. Raymundo, Irene A. Papa, Genevieve Mae B. Aquino, Arian J. Jacildo, Paul Stothard, Albert Remus R. Rosana

Publication title: Microbiology Resource Announcements 7(12): e01048, September 2018

Abstract:

Ralstonia solanacearum strain T523 is the major phytopathogen causing tomato bacterial wilt in the Philippines. Here, we report the complete chromosome and draft megaplasmid genomes with predicted gene inventories supporting rhizosphere processes, extensive plant virulence effectors, and the production of bioactive signaling metabolites, such as ralstonin, micacocidin, and homoserine lactone.

Full text available upon request to the author

Article title: Near complete genome sequence of *Streptomyces* sp. AC1-42T and AC1-42W isolated from bat guano of Cabalyorisa Cave, Pangasinan, Philippines.

Authors: Marian P. De Leon, A-young Park, Andrew D. Montecillo, Maria Auxilia T. Siringan, Albert Remus R., Song-Gun

Publication title: Microbiology Resource Announcements 7(7): e00904-18, 2018

Abstract:

Streptomyces sp. strains AC1-42T and AC1-42W, isolated from bat guano from Cabalyorisa Cave, Mabini, Pangasinan, Philippines, are active against *Bacillus subtilis* subsp. *subtilis* KCTC 3135T. The near-complete genome sequences reported here represent a possible source of ribosomally synthesized, posttranslationally modified peptides, such as lantipeptides, bacteriocins, linaridin, and a lasso peptide.

Full text available upon request to the author

Article title: Complete genome sequence of *Rhizobium* sp. 11515TR isolated tomato rhizosphere from the Philippines

Authors: Andrew D. Montecillo, Asuncion K. Raymundo, Irene A. Papa, Genevieve Mae B. Aquino, Albert Remus R. Rosana

Publication title: Microbiology Resource Announcements 7(7): e00903-18, 2018

Abstract:

Rhizobium sp. strain 11515TR was isolated from the rhizosphere of tomato in Laguna, Philippines. The 7.07-Mb complete genome comprises three replicons, one chromosome, and two plasmids, with a G+C content of 59.4% and 6,720 protein-coding genes. The genome encodes gene clusters supporting rhizosphere processes, plant symbiosis, and secondary bioactive metabolites.

Full text available upon request to the author

Article title: Complete genome sequence of Lactobacillus plantarum subsp. plantarum LB1-2 isolated from the hindgut of European honeybees Apis mellifera L. from the Philippines.

Authors: M. Fatima C. Ilagan-Cruzada, Albert Remus R. Rosana, Andrew D. Montecillo, Noel G. Sabino, Ida F. Dalmacio

Publication title: Genome announcements 6(14): e00209-18, April 2018

Abstract:

Lactobacillus plantarum subsp. plantarum strain LB1-2, isolated from the hindgut of European honeybees in the Philippines, is active against Paenibacillus larvae and has broad activity against several Gram-positive and Gram-negative bacteria. The complete genome sequence reported herein contains gene clusters for multiple bacteriocins and extensive gene inventories for carbohydrate metabolism.

Full text available upon request to the author

Article title: Draft genome sequence of Bacillus paralicheniformis F47 isolated from Algerian salty lake.

Authors: Mohamed Seghir Daas, Albert Remus R. Rosana, Jeella Z. Acedo, Malika Douzane, Farida Nateche, Salima Kebbouche-Gana, John C. Vederas

Publication title: Genome announcements 6(13): e00190-18, March 2018

Abstract:

Bacillus paralicheniformis F47 was isolated from a salty lake in Ain Baida-Ouargla, southern Algeria. The genome contains genes for the production of several bioactive secondary metabolites, including the siderophore bacillibactin, the lipopeptides fengycin, surfactin, and lichenysin, the antibiotics bacitracin and kanosamine, and a putative circular bacteriocin.

Full text available upon request to the author

Article title: Bacillus amyloliquefaciens ssp. Plantarum F11 isolated from Algerian salty lake as a source of biosurfactants and bioactive lipopeptides.

Authors: Mohamed Seghir Daas, Jeella Z. Acedo, Albert Remus R. Rosana, Fabini D. Orata, Béla Reiz, Jing Zheng, Farida Nateche, Rebecca J. Case, Salima Kebbouche-Gana, John C. Vederas
Publication title: FEMS microbiology letters 365(1), January 2018

Abstract:

In this study, we identified a new *Bacillus* strain isolated from an Algerian salty lake that produces metabolites that are active against Gram-positive and Gram-negative bacteria, as well as fungal pathogens. The draft genome sequence of the strain is presented herein. Genome sequence analysis identified the strain to be *B. amyloliquefaciens* subspecies *plantarum* F11, and showed that the strain carries the gene clusters for the production of a number of bioactive and surface-active compounds. These include the lipopeptides surfactin and fengycin, antibacterial polyketides macrolactin and bacillaene, and a putative novel lanthipeptide, among others. Through an activity-guided purification method using hydrophobic interaction chromatographic techniques, we confirmed the ability of the strain to produce fengycin lipopeptides. The identities of the isolated fengycin homologs were ascertained through tandem mass spectrometry.

Full text available upon request to the author

Article title: Draft genome sequences of *Bacillus cereus* E41 and *Bacillus anthracis* F34 isolated from Algerian Salt Lakes

Authors: Mohamed Seghir Daas, Albert Remus R. Rosana, Jeella Z. Acedo, Farida Nateche, Salima Kebbouche-Gana, John C. Vederas, Rebecca J. Case

Publication title: Genome Announcements 5(20): e00383-17, 2017

Abstract:

Two strains of *Bacillus*, *B. cereus* E41 and *B. anthracis* F34, were isolated from a salt lake in Aïn M'lila-Oum El Bouaghi, eastern Algeria, and Ain Baida-Ouargla, southern Algeria, respectively. Their genomes display genes for the production of several bioactive secondary metabolites, including polyhydroxyalkanoate, iron siderophores, lipopeptides, and bacteriocins.

Full text available upon request to the author

Article title: Cyanobacterial RNA helicase CrhR localizes to the thylakoid membrane region and co-sediments with degradosome and polysome complexes in *Synechocystis* sp. strain PCC 6803.

Authors: Albert Remus R. Rosana, Denise S. Whitford, Richard P. Fahlman, George W. Owtrim

Publication title: Journal of Bacteriology 198(15): 2089-2099, 2016

Abstract:

The cyanobacterium *Synechocystis* sp. strain PCC 6803 encodes a single DEAD box RNA helicase, CrhR, whose expression is tightly autoregulated in response to cold stress. Subcellular localization and proteomic analysis results indicate that CrhR localizes to both the cytoplasmic and thylakoid membrane regions and cosediments with polysome and RNA degradosome components. Evidence is presented that either functional RNA helicase activity or a C-terminal

localization signal was required for polysome but not thylakoid membrane localization. Polysome fractionation and runoff translation analysis results indicate that CrhR associates with actively translating polysomes. The data implicate a role for CrhR in translation or RNA degradation in the thylakoid region related to thylakoid biogenesis or stability, a role that is enhanced at low temperature. Furthermore, CrhR cosedimentation with polysome and RNA degradosome complexes links alteration of RNA secondary structure with a potential translation-RNA degradation complex in *Synechocystis*.

Full text available upon request to the author

Article title: Draft Genome Sequences of Seven Bacterial Strains Isolated from a Polymicrobial Culture of Coccolith-Bearing (C-Type) *Emiliana huxleyi* M217

Authors: Albert Remus R. Rosana, Fabini D. Orata, Yue Xu, Danielle N. Simkus, Anna R. Bramucci, Yan Boucher, Rebecca J. Case

Publication title: Genome Announcements 4(4): e00673, July 2016

Abstract:

Strains of Rhodobacteraceae, Sphingomonadales, Alteromonadales, and Bacteroidetes were isolated from a polymicrobial culture of the coccolith-forming (C-type) haptophyte *Emiliana huxleyi* strain M217. The genomes encode genes for the production of algal growth factors and the consumption of their hosts' metabolic by-products, suggesting that the polymicrobial culture harbors many symbiotic interactions.

Full text available upon request to the author

Article title: Draft Genome Sequences of Four Bacterial Strains Isolated from a Polymicrobial Culture of Naked (N-Type) *Emiliana huxleyi* CCMP1516

Authors: Fabini D. Orata, Albert Remus R. Rosana, Yue Xu, Danielle N. Simkus, Anna R. Bramucci, Yan Boucher, Rebecca J. Case

Publication title: Genome Announcements 4(4): e00674-16

Abstract:

Strains of *Sulfitobacter* spp., *Erythrobacter* sp., and *Marinobacter* sp. were isolated from a polymicrobial culture of the naked (N-type) haptophyte *Emiliana huxleyi* strain CCMP1516. The genomes encode genes for the production of phytohormones, vitamins, and the consumption of their hosts' metabolic by-products, suggesting symbiotic interactions within this polymicrobial culture.

Full text available upon request to the author

Article title: Diverse electron sources support denitrification under hypoxia in the obligate methanotroph *Methylobacterium album* strain BG8.

Authors: K. Dimitri Kits, Dustin J. Campbell, Albert R. Rosana, and Lisa Y. Stein

Publication title: Frontiers in microbiology 6: 1-11, 2016

Abstract:

Aerobic methane-oxidizing bacteria (MOB) are a diverse group of microorganisms that are ubiquitous in natural environments. Along with anaerobic MOB and archaea, aerobic methanotrophs are critical for attenuating emission of methane to the atmosphere. Clearly, nitrogen availability in the form of ammonium and nitrite have strong effects on methanotrophic activity and their natural community structures. Previous findings show that nitrite amendment inhibits the activity of some cultivated methanotrophs; however, the physiological pathways that allow some strains to transform nitrite, expression of gene inventories, as well as the electron sources that support this activity remain largely uncharacterized. Here we show that *Methylobacterium album* strain BG8 utilizes methane, methanol, formaldehyde, formate, ethane, ethanol, and ammonia to support denitrification activity under hypoxia only in the presence of nitrite. We also demonstrate that transcript abundance of putative denitrification genes, *nirS* and one of two *norB* genes, increased in response to nitrite. Furthermore, we found that transcript abundance of *pxmA*, encoding the alpha subunit of a putative copper-containing monooxygenase, increased in response to both nitrite and hypoxia. Our results suggest that expression of denitrification genes, found widely within genomes of aerobic methanotrophs, allow the coupling of substrate oxidation to the reduction of nitrogen oxide terminal electron acceptors under oxygen limitation. The present study expands current knowledge of the metabolic flexibility of methanotrophs by revealing that a diverse array of electron donors support nitrite reduction to nitrous oxide under hypoxia.

Full text link <https://tinyurl.com/2p93v3um>

Article title: Autoregulation of RNA helicase expression in response to temperature stress in *Synechocystis* sp. PCC 6803.

Authors: Albert Remus R. Rosana, Danuta Chamot, George W. Owttrim

Publication title: PloS ONE 7: e48683, 2012

Abstract:

RNA helicases are ubiquitous enzymes whose modification of RNA secondary structure is known to regulate RNA function. The pathways controlling RNA helicase expression, however, have not been well characterized. Expression of the cyanobacterial RNA helicase, *crhR*, is regulated in response to environmental signals that alter the redox poise of the electron transport chain, including light and temperature. Here we analyze *crhR* expression in response to alteration of abiotic conditions in wild type and a *crhR* mutant, providing evidence that CrhR autoregulates its own expression through a combination of transcriptional and post-transcriptional mechanisms. Temperature regulates *crhR* expression through alteration of both transcript and protein half-life which are significantly extended at low temperature (20°C). CrhR-dependent mechanisms regulate both the transient accumulation of *crhR* transcript at 20°C and stability of the CrhR protein at all temperatures. CrhR-independent mechanisms regulate temperature sensing and induction of *crhR* transcript accumulation at 20°C and the temperature regulation of *crhR* transcript stability, suggesting CrhR is not directly associated with *crhR* mRNA turnover. Many of the processes are CrhR- and temperature-dependent and

occur in the absence of a correlation between crhR transcript and protein abundance. The data provide important insights into not only how RNA helicase gene expression is regulated but also the role that rearrangement of RNA secondary structure performs in the molecular response to temperature stress. We propose that the crhR-regulatory pathway exhibits characteristics similar to the heat shock response rather than a cold stress-specific mechanism.

Full text available upon request to the author

Article title: Inactivation of a Low Temperature-Induced RNA Helicase in *Synechocystis* sp. PCC 6803: Physiological and Morphological Consequences

Authors: Albert Remus R. Rosana, Meghana Ventakesh, Danuta Chamot, Laura M. Patterson-Fortin, Oxana Tarassova, George S. Espie, George W. Owttrim

Publication title: Plant and Cell Physiology 53(4): 646-658, April 2012

Abstract:

Inactivation of the DEAD box RNA helicase, crhR, has dramatic effects on the physiology and morphology of the photosynthetic cyanobacterium, *Synechocystis* sp. PCC 6803. These effects are observed at both normal growth temperature (30°C) and under cold stress (20°C), indicating that CrhR performs crucial function(s) at all temperatures. A major physiological effect is the rapid cessation of photosynthesis upon temperature downshift from 30 to 20°C. This defect does not originate from an inability to transport or accumulate inorganic carbon or a deficiency in photosynthetic capacity as the mutant has sufficient electron transport and enzymatic capacity to sustain photosynthesis at 30°C and inorganic carbon (Ci) accumulation at 20°C. Oxygen consumption in the presence of methyl viologen indicated that while electron transport capacity is sufficient to accumulate Ci, the mutant does not possess sufficient activity to sustain carbon fixation at maximal rates. These defects are correlated with severely impaired cell growth and decreased viability, cell size and DNA content at low temperature. The Δ crhR mutant also progressively accumulates structural abnormalities at low temperature that cannot be attributed solely to reactive oxygen species (ROS)-induced photooxidative damage, suggesting that they are manifestations of pre-existing defects that are amplified over time. The data indicate that the observed physiological and morphological effects are intimately related to crhR mutation, implying that the lack of CrhR RNA unwinding/annealing activity results in the inability to execute one or more vital steps in photosynthesis that are required at all temperatures but are crucial at low temperature.

Full text link <https://tinyurl.com/58nr5e7t>

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Researches:

Article title: Estimation of Biomass Availability in Panglao Island Using SENTINEL-2 MSI

Authors: W. N. Galang, I. D. F. Tabañag and M. E. Loretero

Publication title: Nature Environment and Pollution Technology 20(4), December 2021

Abstract:

Remote Sensing (RS) technology using SENTINEL-2 Multispectral Instrument (MSI) imagery was used in the estimation of residual biomass' available energy potential. The estimation was done in Panglao Island, within the province of Bohol, Philippines. Estimation of biomass availability was processed using Geographical Information System (GIS) software incorporating the calculation of Normalized Difference Vegetation Index (NDVI) to extract information on land resources and its spatial distribution. It was found that the majority of vegetation cover on the island is in the form of perennial woody plants and coconut trees. Coconut production on the island of Panglao contributed 1.26% of the total cultivation area for the province based on processed captures of Sentinel-2 imagery. The residue concentration amounted to 2,865 tons of coconut residues based on the RPR method. This amount of residues can be translated to 52.92 TJ of theoretical energy potential. The result of this study may serve as a baseline for the locality to consider the utilization of agricultural residues such as coming from coconut trees to support the use of indigenous resources for energy generation.

Full text link <https://tinyurl.com/4nmebsd6>

Article title: GIS-Based Biomass Energy Sustainability Analysis Using Analytical Hierarchy Process: A Case Study in Medellin, Cebu

Authors: Wenyville Nabor Galang, Ian Dominic Tabañag, Michael Loretero

Publication title: International Journal of Renewable Energy Development 10(3):551-561, August 2021

Abstract:

The increasing demand for energy accounts for an alternative energy source. The search for biomass being abundant in an agricultural country is a suitable option to power a community. This paper used Analytical Hierarchy Process (AHP), which includes the organized hierarchy of various selection criteria, the assessment of the relative value of criteria, the comparison and an aggregate rating of the alternatives for each criterion. Specifically, the methodology used was the combination of multi-criteria and weighted-overlay analysis in a Geographical Information System (GIS) environment to provide a spatial overview of the sustainable location for sugarcane residues production in Medellin, Cebu. The study was able to identify Caputatan Sur and Canhabagat as sustainable locations for sugarcane residue production with respect to topography, cultivation area and accessibility. These locations represent 26% of the total cultivation area and average sugarcane production of the locality. The result of this study is an initial step in the support for the utilization of sugarcane residues to answer energy demand in remote areas and further promote the use of indigenous resources for energy generation.

Full text link <https://tinyurl.com/2fekyedp>

Article title: GIS-based site suitability analysis for biomass power plant in Bohol

Authors: Galang, W. N., Tabañag, I. D. F., and Loretero, M. E.

Publication title: International Journal of Agricultural Technology 17(5): 1711-1726, 2021

Abstract:

Site suitability is an essential process in determining potential sites for power plant development with respect to some economic and environmental factors, such as road access, land surface features, crop distribution, and the population's energy demand. In terms of the working population and land usage, agriculture remains to be Bohol's largest sector. Agriculture covers more than half of the province's total land area. It was found that the municipalities of Dagohoy, San Miguel, Talibon, Trinidad and Ubay are abundant in coconuts, accounting for 38% of agricultural land and cultivating rice on about 32% of their agricultural area. The large croplands offer an abundant supply of agricultural residues. Along with an increasing number of people located some distance from croplands, electricity may be used efficiently. Furthermore, the municipality of Ubay was identified as the most suitable site for plant development through the integration of the GIS approach that allowed the analysis of the top rice and coconut areas in the province to determine the most suitable location that balanced economic and environmental criteria within the biomass supply.

Full text link <https://tinyurl.com/2p89nfhr>

Article title: RS-GIS Approach on Biomass Energy Potential Estimation of Sugarcane Residues in Medellin, Cebu.

Authors: Wenynville Nabor Galang, Ian Dominic Tabañag, Michael Loretero

Publication title: Applied Environmental Research 44(1), 2021

Abstract:

The need to use alternative energy sources is driven by the continued rise in fossil fuel price, increasing population and energy demand most particularly in a developing country like the Philippines. Biomass resources such as sugarcane residues provide alternative means to utilize its untapped potential for renewable energy. The use of remote sensing technology and geo-graphic information system enables detailed assessment on the quantification of its distribution, abundance and quality that will yield an effective and efficient use of its potential. Available energy potential measurement was conducted in the town of Medellin, part of Bogto-Medellin mill district, in the northern region of Cebu province. The calculation was assessed using the remote sensing technology of Light Detection and Ranging (LiDAR) data. This baseline valuation serves as primary input to obtain detailed resource information on specific cultivation land areas for sugarcane with the aid of GIS-based calculations. The calculation considered crop yield, residue-to-product ratio, cultivation area, moisture content and heating value of the crop for a detailed resource assessment. The results revealed the georeferenced location of specific sugarcane residue energy potential in the town of Medellin. The RS-GIS approach in biomass energy potential estimation provides a cost effective way to obtain the overview of spatial variation in agricultural bioresource of the locality.

Full text available upon request to the author

Article title: A Geospatial Approach to Energy Planning in Aid of Just Energy Transition in Small Island Communities in the Philippines

Authors: Khrysdel Rhea M. Supapo, Lorafe Lozano, Ian Dominic F. Tabañag, and Edward M. Querikiol

Publication title: Applied Sciences 11(24):11955, 2021

Abstract:

Providing electricity in off-grid island communities is a big challenge, exacerbated by the high cost of transporting fossil fuels and the non-viability of extending grid connections. Installing renewable energy systems in these areas is deemed a practical solution, especially supporting just energy transitions in these communities. However, the lack of information about resource availability and the most suitable locations hinders effective planning. This paper aims to determine the sufficiency of available renewable energy sources to meet the electricity demand of off-grid island communities. It is achieved through a three-phased approach: (1) an assessment stage; (2) geospatial analysis; and (3) technical potential estimation. The approach is applied in three island communities in Palawan, namely Araceli, Balabac, and Cuyo, where a diesel power plant currently provides electricity to its households and commercial/institutional

establishments. The results indicate that the three islands can be powered by 3, 1.5, and 11 MW solar photovoltaic farms, respectively, which is sufficient to meet the projected demand until 2030. The approach can be helpful, especially for off-grid island communities, as they plan to provide universal electricity access using renewable energy sources.

Full text link <https://tinyurl.com/496dcpj4>

Article title: Effects of Aqueous Ethanol Concentration and Solid-to-Liquid Ratio in the Extraction of Organosolv Lignin from Mango (*Mangifera indica* L.) Seed Husk

Authors: Francis Dave C. Siacor, Ian Dominic F. Tabañag, Camila Flor Y. Lobarbio, Evelyn B. Taboada

Publication title: Science and Technology Asia 26(2), 2021

Abstract:

The Philippines is abundant with agricultural residues that are seemingly underutilized and undervalued. One of these residues is mango seed husks (MSH) generated from the mango processing industry. The current practice of discarding MSH to open dumpsites poses health and environmental concerns. This ushered in the need to address this issue. As lignocellulosic biomass, the major components of MSH are cellulose (~56%), hemicellulose (~18%), and lignin (~12%), which exhibit potential in several applications. Lignin, a natural biopolymer, has become an important compound in biorefineries. The exploitation of MSH to recover lignin necessitates several methods, such as the organosolv process using aqueous ethanol. In this study, lignin from MSH was recovered via the ethanol organosolv process. Specifically, the effects of ethanol concentration (50%, 65%, 80%) and solid-to-liquid ratio (SLR; 1:5, 1:7, 1:10) under fixed reaction time (4 hours) and temperature (95°C) on the recovery of lignin, in terms of %acid-soluble lignin (ASL), was investigated. The results show that higher lignin recovery is obtained at lower SLR and ethanol concentration. Response surface modeling revealed the combined effects of %ethanol and SLR on %ASL, in which linear effects imparted negative influence on %ASL, while quadratic and two-way interaction effects have a positive impact on the response variable. Furthermore, elucidation of lignin constituents in the extract, as well as its properties and biological activities, is seen to be an important undertaking to assess the appropriate application of the recovered lignin.

Full text link <https://tinyurl.com/yc5s2zh3>

Article title: Extraction of lipids from post-hydrolysis copra cake with hexane as solvent: Kinetic and equilibrium data

Authors: Kezia Gaile D. Te, Alchris Woo Go, Hanneh Jonna D. Wang, Reinell G. Guevarra, Luis K. Cabatingan, Ian Dominic F. Tabañag, Artik Elisa Angkawijaya, Yi-Hsu Ju

Publication title: Renewable Energy 158: 311-323, October 2020

Abstract:

Copra cake (CC), an agro-industrial residue produced in the manufacture of coconut oil, still has a considerable amount of lipids (~15 %w/w). In order to valorize the residue, CC was subjected

to dilute acid hydrolysis to produce a solid residue with higher lipid content of ~25 %w/w. Considering the substantial amount of lipids available in the post-hydrolysis copra cake (PHCC), it is necessary to gather lipid extraction kinetics and equilibrium data for process and equipment design. The effects of solvent-to-solid ratio (4, 8, and 12 mL/g) and temperature (30, 40, and 50 °C) on the kinetics and equilibrium of lipid extraction from PHCC using n-hexane as solvent was investigated. Regardless of extraction temperature and SSR, equilibrium is reached in less than 10 min. To appropriately describe the lipid extraction system, various kinetic models were fitted, with the Modified-Peleg's model best representing the extraction process ($R^2 \geq 0.95$). Extraction of lipids from PHCC required less amount of solvent to extract and recover the same amount of lipids present in CC. The fatty acids in the extracted lipids are primarily lauric acid. Fuel properties based on the fatty acid profile, as estimated using empirical models, were found to be suitable as biodiesel.

Full text available upon request to the author

Article title: Sugarcane processing by-products for bioethanol production in the Philippines: a retrospective assessment from 2007 to 2017 and future challenges

Authors: Alchris Woo Go, Ian Dominic F. Tabañag, Yi-Hsu Ju, Angelique T. Conag, Arjay S. Toledo, John Wilbert Orilla, Artik Elisa Angkawijaya

Publication title: Biofuels 13(5):1-11, 2020

Abstract:

Sugarcane has been tapped as a source of sugar and molasses for the production of bioethanol in the Philippines. The increasing demand in bioethanol due to the rising consumption of gasoline, the surplus sugar and molasses would not be able to meet future demands. In the harvesting and processing of sugarcane, residues like that of sugarcane leaves (SCL) and sugarcane bagasse (SCB) are generated. These residues are composed of sugar-based fibers, which may be utilized in producing bioethanol. Despite sugarcane residues being among the abundant crop residues generated, assessment on their potential for bioethanol production have been scarce. An initial assessment of the potentials of utilizing SCL and SCB produced in the Philippines and their contribution when utilized as raw material for bioethanol production is provided in this work. The geographical scenario of the Philippines was also taken into consideration. The limitations that could potentially be brought about by the competing use of available resource for bioenergy generation are also discussed. It is hoped that this work will provide a simple approach in providing or generating quantitative baseline information for consideration in future policies to avoid potential competition and emphasize on the need for appropriate allocation of available resources.

Full text available upon request to the author

Article title: Ethanol production from hemicellulose by a consortium of different genetically-modified *sacharomyces cerevisiae*

Authors: Ian Dominic F. Tabañag, I-Ming Chu, Yu-Hong Wei, Shen-Long Tsai

Publication title: Journal of the Taiwan Institute of Chemical Engineers 89:15-25, August 2018

Abstract:

In this study, *Saccharomyces cerevisiae* was engineered to degrade and utilize xylan, one of the major polysaccharide chains present in hemicellulose. Different hemicellulases from *Trichoderma reesei*, namely: endoxylanase, β -xylosidase, acetylxyylan esterase, α -D-glucuronidase and α -L-arabinofuranosidase, were heterologously secreted by *S. cerevisiae*. A mixture experimental design was adapted to statistically describe the synergistic interactions between the hemicellulases and to determine the optimum formulations for the hydrolysis of xylan substrates. The hydrolytic activities of the hemicellulase mixtures were then improved by displaying the hemicellulases on the yeast surface as whole-cell biocatalysts. The engineered yeast strains displaying hemicellulases were further engineered to express xylose-utilization genes xylose isomerase (XI) and xylulokinase (XK) which enable its utilization of xylose as a sole carbon source. The resulting consortium was then able to grow and produce ethanol from different xylan substrates

Full text available upon request to the author

Article title: "Decorating outer membrane vesicles with organophosphorus hydrolase and cellulose binding domain for organophosphate pesticide degradation."

Authors: Fu-Hsiang Su, Ian Dominic Flormata Tabañag, Chih-Yun Wu, Shen-Long Tsai

Publication title: Chemical Engineering Journal 308:1-7, January 2017

Abstract:

Outer membrane vesicles (OMVs) are nanoscale spheres naturally released from Gram-negative bacteria. They contain a diverse array of proteins and lipopolysaccharide but do not replicate, which increases their safety profile and renders them attractive for environmental applications. Herein, an efficient and reusable biocatalyst for enhanced degradation of organophosphate pesticides was developed. Organophosphorus hydrolase (OPH) was tethered onto OMVs via a genetically fused ice nucleation protein (INP) to form OMV-based biocatalysts. To accomplish quick purification and easy recovery of the engineered OMV using cellulose, a cellulose binding module (CBM) was collaterally tethered on the OMV. The OPH-decorated OMVs exhibited an enhanced degradation rate when assayed with paraoxon as a substrate. In addition, the thermal stability and pH tolerance were also enhanced remarkably. Furthermore, the resulting biocatalysts could still retain more than 80% activity even after 15 cycles of recovery and reuse, demonstrating their potential use in bio-catalytic decontamination of organophosphate compounds.

Full text available upon request to the author

Paper Presentations:

Article title: Transforming yeast into whole-cell biocatalysts: looking at its role in establishing the bio-based economy.

Authors: Ian Dominic F. Tabañag

Conference title: 81st Philippine Institute of Chemical Engineers National Convention, Bacolod, Philippines, 2020

Article title: Addressing Our Country's Need for Biofuels: Looking at Chemical Engineers Establishing a Bio-Based Economy in the Visayas Region.

Authors: Ian Dominic F. Tabañag

Conference title: 2nd Philippine Institute of Chemical Engineers Visayas Regional Conference, Ormoc City, Leyte, Philippines, 2019

Article title: Valorization of Lignin Derived from Spent Degumming Liquor for Solid Biofuels Production.

Authors: Ian Dominic F. Tabañag

Conference title: 14th Asian Congress on Biotechnology in Conjunction with the 2019 Biochemical Engineering Society of Taiwan (BEST) Conference and International Symposium on Biotechnology and Bioengineering, Taipei, Taiwan, 2019

Article title: Valorization of Lignin Derived from Spent Degumming Liquor for Solid Biofuels Production.

Authors: Ian Dominic F. Tabañag

Conference title: 4th University Research Conference, University of San Carlos, Cebu City, Philippines.

Article title: Valorization of Sugarcane Residues for the Production of Bioethanol in the Philippine Context: A Retrospective Assessment from 2007-2017 and Future Challenges.

Authors: John Wilbert A. Orilla, Alchris Woo Go, Angelique T. Conag, Arjay S. Toledo, Yi-Hsu Ju, Ian Dominic F. Tabañag

Conference title: 2019 National Research Council of the Philippines (NRCP) Annual Scientific Conference, Manila, Philippines. 2019

Article title: Sugarcane processing by- products for bioethanol production in the Philippines: A retrospective assessment from 2007 to 2017 and future challenges.

Authors: John Wilbert A. Orilla, Alchris Woo Go, Angelique T. Conag, Arjay S. Toledo, Yi-Hsu Ju, Ian Dominic F. Tabañag

Conference title: 11th Regional Conference in Energy Engineering (RCEnE), Manila, Philippines.

Abstract:

Full text available upon request to the author

Article title: Hydrolysis of Xylan Substrates by Engineered *Saccharomyces cerevisiae* Strains Expressing the *Trichoderma reesei* Hemicellulases on their Cell Surface.

Authors: Ian Dominic F. Tabañag and Shen-Long Tsai

Conference title: 2017 International Conference on Engineering and Information Technology, Cebu, Philippines. 2017

Article title: Expression and Secretion of the *Trichoderma reesei* Hemicellulase System by *Saccharomyces cerevisiae* for Xylan Hydrolysis.

Authors: Ian Dominic F. Tabañag, Yu-Hong Wei, I-Ming Chu, Shen-Long Tsai

Conference title: Biotechnology and Biochemical Engineering Society of Taiwan (BEST) 2016 Conference and International Symposium, National Central University, Taoyuan, Taiwan.

Article title: Engineering *Saccharomyces cerevisiae* as Whole-Cell Biocatalysts for Xylan Hydrolysis.

Authors: Ian Dominic F. Tabañag and Shen-Long Tsai

Conference title: The 2016 International Symposium for Young Chemical Engineers (2016 iSyCE), National Taiwan University of Science and Technology, Taipei, Taiwan.

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**DR. LYN MARIE DE JUAN-CORPUZ***Textiles*

Dr. De Juan-Corpuz is currently an S&T Fellow in DOST-PTRI. She specializes in the development of 1D nanomaterials as anode material for lithium-ion batteries. She is a co-founder of an R&D start-up company called Nanolabs LRC. Co. Ltd, which oriented in providing nano-based solutions to environmental and societal problems. She has patented several technologies including rechargeable zinc-ion batteries, flexible electrodes, and a flexible solid polymer electrolyte-reduce graphene oxide nanocomposite

Sex: Female

Education:

Doctor of Philosophy in Materials Science and Engineering, Hokkaido University, Japan, 2018

Master of Science in Materials Science and Engineering, University of the Philippines, 2014

Bachelor of Science in Chemical Engineering, University of Santo Tomas, 2009

Field of Specialization

Material characterization

Nanomaterials

X-ray Diffraction

Material Characteristics

Thin Films and Nanotechnology

Microstructure

Materials Processing

Mechanical Properties

Researches:

Article title: Electrochemical exploration of the effects of calcination temperature of a mesoporous zinc vanadate anode material on the performance of Na-ion batteries

Authors: Rasu Muruganantham, Irish Valerie Buiser Maggay, Lyn Marie Z. De Juan, Mai Thanh Nguyen, Tetsu Yonezawa, Chia-Her Lin, Yan-Gu Lind and Wei-Ren Liu

Publication title: Inorganic Chemistry Frontiers, June 2019

Abstract:

Nowadays, transition metal oxide is rapidly developed for Na-ion storage anode materials, which provides relatively high theoretical capacity than the graphitic anode. However, the evaluations of enhanced electrochemical performance of NIBs are ongoing progress via various approaches such as coating or doping and so on. Hence this work, Spinel structure bimetal oxide ZnV_2O_4 mesoporous material is successfully synthesized via solvothermal technique followed by calcined at different temperatures. The impacts of calcination temperatures on the

Na-ion storage anode performance are thoroughly investigated for the first time. The initial discharge capacities of 178, 251, 296 mAh.g⁻¹ are obtained for 500, 600, and 700°C, respectively. After 250 cycles, ZVO-700 electrode exhibits to retain 166 mAh.g⁻¹ at 200 mA.g⁻¹ with a high coulombic efficiency of 99%. Meanwhile, ZVO-500 and ZVO-600 retained 55 mAh.g⁻¹ and 99 mAh.g⁻¹ with ~27% and ~42% retention rate, respectively. The electrochemical Na-ion storage is predicted by the conversion reaction of ZnV₂O₄. Moreover, the ZVO-700 sample showed a higher surface area and pore volume than that of ZVO-500 and ZVO-600 °C samples, which leads to remarkable electrochemical performance.

Full text available upon request to the author

Article title: Electrochemical properties of novel FeV₂O₄ as an anode for Na-ion batteries

Authors: Irish Valerie B. Maggay, Lyn Marie Z. De Juan, Jeng-Shin Lu, Mai Thanh Nguyen, Tetsu Yonezawa, Ting-Shan Chan & Wei-Ren Liu

Publication title: Scientific Reports 8(1), June 2018

Abstract:

Spinel based transition metal oxide - FeV₂O₄ is applied as a novel anode for sodium-ion battery. The electrochemical tests indicate that FeV₂O₄ is generally controlled by pseudo-capacitive process. Using cost-effective and eco-friendly aqueous based binders, Sodium-Carboxymethylcellulose/Styrene butadiene rubber, a highly stable capacity of ~97 mAh.g⁻¹ is obtained after 200 cycles. This is attributed to the strong hydrogen bonding of carboxyl and hydroxyl groups indicating superior binding with the active material and current collector which is confirmed by the ex-situ cross-section images of the electrode. Meanwhile, only ~27 mAh.g⁻¹ is provided by the electrode using poly(vinylidene difluoride) due to severe detachment of the electrode material from the Cu foil after 200 cycles. The obtained results provide an insight into the possible applications of FeV₂O₄ as an anode material and the use of water-based binders to obtain highly stable electrochemical tests for sodium-ion battery.

Full text link <https://tinyurl.com/2c535aew>

Article title: β-Sn nanorods with Active (001) Tip Induced LiF-Rich SEI Layer for Stable Anode Material in Lithium-ion Battery

Authors: Lyn Marie Z. De Juan, Irish Valerie B. Maggay, Mai Thanh Nguyen, Wei-Ren Liu, and Tetsu Yonezawa

Publication title: Applied Nanomaterials 1(7): 3509-3519, 2018

Abstract:

β-Sn nanorod (NR) with (200) facets and (001) tip is a potential anode material in lithium ion battery (LIB) due to its good cycle stability that can retain ~600 and 550 mA h g⁻¹ after 100 cycles using 0.2 C for high and low aspect ratios, respectively. The high stability compared to that of spherical nanoparticles can be attributed to the combination of the nanorod morphology that buffers large volumetric change, and the LiF-rich F-containing surface electrolyte interface (SEI) layer that allows for a stable SEI layer and a good ionic and electronic conductivity. The

lower SEI resistivity and high Li^+ diffusivity of low aspect ratio β -Sn NRs resulted in a better cyclability compared to high aspect ratio β -Sn NRs. These can be attributed to the higher specific surface area of highly reactive (001) surface, i.e., the tip of the rod, that produces a LiF-rich F-containing SEI layer of the lower aspect ratio compared to that of the higher aspect ratio β -Sn NRs.

Full text available upon request to the author

Article title: ZnV_2O_4 : A potential anode material for sodium-ion batteries

Authors: Irish Valerie Buiser Maggay, Lyn Marie Z. De Juan, Mai Thanh Nguyen, Tetsu Yonezawa, B.K. Chang, T. S. Chan, Wei-Ren Liu

Publication title: Journal of the Taiwan Institute of Chemical Engineers 88 :161-168, July 2018

Abstract:

A template-free solvothermal method was employed to successfully obtain ZnV_2O_4 spinel oxide and its electrochemical properties as anode materials for sodium ion battery system were investigated for the first time. The structural, morphological, elemental composition, electrochemical properties and theoretical calculations of the as-prepared ZnV_2O_4 were carried out. XRD revealed the presence of ZnO and VO_2 impurities when synthesized for 1 day, while complete formation of ZnV_2O_4 was attained when the synthesis procedure was increased to 3 days. When cycled at 50 mA/g, it delivered an initial capacity of as high as 537 mAh/g at a potential window of 0.01–3.0 V. Meanwhile, a reversible capacity of ~ 113 mAh/g was obtained when cycled at 100 mA/g for 30 cycles. These results indicate the potential applications of ZnV_2O_4 as anode materials for sodium ion battery systems.

Full text available upon request to the author

Article title: Structural Control Parameters for Formation of Single-Crystalline β -Sn Nanorods in Organic Phase

Authors: Lyn Marie Z. De Juan, Mai Thanh Nguyen, Tetsu Yonezawa*Orcid, Tomoharu Tokunaga, Hiroki Tsukamoto, and Yohei Ishida

Publication title: Crystal Growth & Design 17(9), July 2017

Abstract:

For the first time, investigation on the effect of lowering the synthesis temperature below room temperature (10 to -10°C) and increasing the viscosity of the reaction solution at certain temperatures have been used to trigger the formation of single-crystalline β -Sn nanorods (NRs) in a chemical synthesis using an organic solvent. These two parameters govern the energy of the particles in the solution, thereby mediating the selective attachment to the nuclei and the preferential growth of Sn along the c-axis. The length and aspect ratio of the NRs were inversely proportional to the synthesis temperature and directly proportional to the viscosity of the reaction solution. In addition, we found that poly(vinylpyrrolidone) (PVP) with a high molecular weight aided the formation of longer and higher aspect ratio NRs via the bridge flocculation effect.

Full text available upon request to the author

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**DR. FREDMOORE L. OROSCO***Virology*

Dr. Orosco is currently an S&T Fellow in DOST-ITDI. He received his PhD in Biology from the University of the Philippines Diliman. He is a former Supervising Science Research Specialist in the UP Marine Science Institute working in the genome assemble and characterization of endogenous viral elements in crustaceans using comparative paleovirology approach. He was also involved in other research involving metaviromics, virus diagnostics, and virus diversity.

Sex: Male**Education:**

Doctor of Philosophy in Biology (Cell and Molecular Biology), University of the Philippines Diliman

Bachelor of Science in Biology (Cell and Molecular Biology), University of the Philippines Los Baños

Field of Specialization

Environmental Microbiology

Next Generation Sequencing

Genomics

Bioinformatics and Computational Biology

DNA Sequencing

DNA Extraction

Gel Electrophoresis

Researches:

Article title: Genetic diversity of *penaeus monodon* (Fabricius, 1798) in the Philippines as revealed by mitochondrial Cytochrome Oxidase I (COI)

Authors: Fredmoore L. Orosco and A.O. Lluisma

Publication title: Philippine Agricultural Scientist 101(1):84-92, March 2018

Abstract:

The mitochondrial cytochrome oxidase I (COI) marker, widely used in phylogenetic and DNA barcoding studies, may also be informative with respect to intraspecies diversity and regional scale population structure. It is particularly useful when data reported from other studies and relevant for comparative studies were mostly generated using this marker. In this study, the COI marker was used to investigate the genetic diversity and structure of populations of the black tiger shrimp, *Penaeus monodon* (Fabricius, 1798), in the Philippines. Wild specimens were obtained from six locations across the Philippine archipelago. Among the 146 COI sequences

observed, only 15 haplotypes were identified of which only three were found to be frequent and widely distributed and the others were either unique to a site, or found in only two sites. The COI sequences therefore indicated that the six sites did not show significant genetic differentiation based on the Chi-square test, analysis of molecular variance (AMOVA), and FST analysis. However, comparison of the data with those reported for Thailand revealed that the Philippine populations have significantly lower haplotype and nucleotide diversity. The three widely distributed haplotypes in the Philippines were also observed in Thailand; these three haplotypes appeared to be the ancestral forms as suggested by the haplotype network analysis. The Philippine haplotypes showed less sequence divergence among themselves and clustered mostly in one major lineage of the tree, although two haplotypes were found to be highly divergent and clustered with other Thai haplotypes. The genetic diversity discovered in the study represents a significant resource; it also highlights opportunities for selection of better performing stocks.

Full text available upon request to the author

Article title: Prevalence, diversity, and co-occurrence of the white spot syndrome virus, monodon baculovirus and *Penaeus stylirostris* densovirus in wild populations of *P. monodon* in the Philippines

Authors: Fredmoore L. Orosco and Arturo O. Lluisma

Publication title: Diseases of Aquatic Organisms 125(3), August 2017

Abstract:

The farming of the black tiger shrimp *Penaeus monodon* in the Philippines relies on wild broodstock. PCR was thus used to determine the prevalence of white spot syndrome virus (WSSV), monodon baculovirus (MBV) and *Penaeus stylirostris* densovirus (PstDV) in a total of 178 shrimp from 6 geographically disparate locations where broodstock are captured for use in hatcheries. PCR amplicons were also sequenced to identify phylogenetic relationships of the virus haplotypes detected. Shrimp from southeastern Luzon (Camarines Norte) had the highest prevalence of each of the 3 viruses and were frequently co-infected with 2 or more viruses. No viruses were detected in shrimp from northwestern Luzon (Pangasinan). MBV was most prevalent and PstDV strains displayed the most genetic diversity. WSSV was detected at 3 sites, and a VP28 gene sequence examined was invariant and consistent with strains found in many countries, including Thailand, China, Japan, Korea, Indonesia, Iran, Brazil and Mexico. WSSV open reading frame 94 gene sequence analysis identified location-specific repeat types. MBV sequences were dissimilar to haplotypes detected in India. PstDV sequences were diverse and included 2 lineages detected either in Australia or in the United States, Ecuador, Taiwan, China and Vietnam. The PCR data confirmed that WSSV, MBV and PstDV are endemic in *P. monodon* in the Philippines but that populations at some locations might remain free of infection.

Full text link <https://tinyurl.com/ebzve526>

Article title: Variation in virome diversity in wild populations of *Penaeus monodon* (Fabricius 1798) with emphasis on pathogenic viruses

Authors: Fredmoore L. Orosco and Arturo O. Lluisma

Publication title: VirusDisease 28(3):1-10, July 2017

Abstract:

Marine animals typically harbor a community of viruses, a number of which are known to cause diseases. In shrimp aquaculture, viral pathogens are the principal causes of major economic losses. However, the composition of the viral load of shrimps in wild population is poorly known. In this study, we explored the viral diversity in the microbiome of wild *Penaeus monodon* collected from six sites in the Philippines, with a view to detecting pathogenic forms. We employed a metagenomic approach via particle-associated nucleic acid isolation, sequence-independent single primer amplification, and pyrosequencing. Virome analysis of shrimp samples from different sites revealed distinct virome profiles, and hence significant differences in diversity, among the various sites based on number of OTUs, Shannon-Weaver Index, and Inverse Simpson Index. Sequences of key shrimp pathogens were detected such as the white spot syndrome virus (WSSV), and *Penaeus stylirostris* densovirus (PstDV). However, the patterns of distribution of the pathogenic viruses varied; whereas WSSV was found only in three out of six sites and PstDV was found in all but one site. The results also revealed shrimp-associated viruses that have not yet been observed in *P. monodon* such as avian virus-like, insect virus-like, plankton virus-like and bacteriophage-like sequences. Despite the diverse array of viruses detected in the study, a large proportion remains unidentified (i.e., similarity to sequences in the database was lower than the threshold required for definitive identification), and therefore could represent unexplored virus sequences and viral genomes in the environment.

Full text available upon request to the author

Article title: Genome Shuffling for Improved Thermotolerance, Ethanol Tolerance and Ethanol Production of *Saccharomyces cerevisiae* 2013

Authors: Fredmoore L. Orosco, Sean M. Estrada, Jessica F. Simbahan, Virgie A. Alcantara, Irene G. Pajares

Publication title: Decision Science Letters 10(01), January 2017

Abstract:

Bioethanol production has been the center of interest of scientists to generate a more sustainable, low cost and environment-friendly fuel compared to petroleum fuel products. However, a more robust and high performing ethanologen still needs to be developed to effectively convert sugars to ethanol while withstanding chemical and thermal stress. In this study, genome shuffling through ethyl methanesulfonate (EMS) mutagenesis and protoplast fusion was performed to develop superior strains of *Saccharomyces cerevisiae* 2013 with improved ethanol tolerance, thermotolerance and ethanol production. Results of the experiment obtained eight promising strains. These isolates exhibited higher ethanol yield compared to the parental strain at 30 °C and 42 °C. Furthermore, these isolates remained stable and viable up to 42 °C in 15 % (w/v) to 18 % (w/v) ethanol. Data on presence of trehalose content further

supported these observations. Improved strain, F1D, was found to be the most promising isolate being able to grow at 42 °C and 18 % ethanol and yielding 10.83 % higher ethanol than parental strain 2013 and 15.16 % over the industrial strain *S. cerevisiae* HBY3. Thus, genome shuffling is a powerful tool in developing *S. cerevisiae* 2013 strains with improved fermentation qualities.

Full text link <https://tinyurl.com/ydw3knm9>

Article title: Genetic diversity of Kappaphycus species (Gigartinales, Rhodophyta) in the Philippines

Authors: Richard V. Dumilag, Fredmoore L. Orosco, Arturo O. Lluisma

Publication title: Systematics and Biodiversity 14(5):441-451, March 2016

Abstract:

The mariculture of eucheumatoids (species of Kappaphycus and Eucheuma) in the Philippines has had a long history, dating back to the 1970s. Over this period, a number of varieties have been brought into domestication; some are now widely distributed and farmed in various regions of the country, but a significant number appear to have a more restricted distribution and are farmed only in certain areas. The taxonomy of many of these seaweed cultivars and their phylogenetic relationships still remain to be resolved at the specific and subspecific levels. In this study, two mitochondrial DNA markers, COI-5P region and cox2-3 intergenic spacer, were used to assess the genetic diversity of the farmed varieties and a few specimens collected from the wild. Analysis using haplotype networks revealed several new haplotypes for *K. alvarezii*, *K. malesianus* and *K. striatus*, mainly from specimens collected from eastern and southwestern regions of the Philippines. The inferred phylogenetic relationships based on both mtDNA markers resolved the identity of all the materials used in the study at the species level. We present molecular evidence that *K. malesianus*, in addition to *K. alvarezii*, *K. cottonii*, *K. inermis*, *K. procrusteanus* and *K. striatus* (and, hence, all currently recognized species of Kappaphycus) occurs in the Philippines. Collectively, these observations suggest that the Philippine archipelago has richer genetic diversity of farmed and wild Kappaphycus than do the other geographic regions, consistent with the hypothesis that the Philippines is, or is part of, the centre of Kappaphycus biodiversity in the world. These findings also reveal an untapped diversity that can potentially be exploited for improving the commercial production of these carrageenophytes.

Full text available upon request to the author

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Dr. Pascual is one of the S&T Fellows at DOST-PNRI. He is a nuclear medicine physician with particular interest in Pediatric Nuclear Medicine and PET, Quality Management Systems, Health Education, Health Economics, Project Management, and Capacity Building. He dreams of making the Philippines a public hub for innovative nuclear medicine research and radio pharmaceutical development in Asia and worldwide

Sex: Male**Education:**

Masters of Science in Health Economics for Health Professionals, Health Economics, University of Aberdeen, Scotland, 2021

Master in Health Professions Education, University of Santo Tomas, 2007

Doctor of Medicine, Nuclear Medicine, University of Santo Tomas, 1999

Bachelor of Science in Biochemistry and Molecular Biology, University of Santo Tomas, 1995

Field of Specialization

Nuclear Medicine

PET Imaging

Molecular Imaging

Nuclear Imaging

Medical Imaging

Scintigraphy

PET/CT

Researches:

Article title: Validation of convolutional neural network for fast determination of whole-body metabolic tumor burden in pediatric lymphoma

Authors: Elba Etchebehere, Rebeca Andrade, Mariana Camacho, Mariana Lima, Anita Brink, Juliano Julio Cerci, Helen Nadel, Chandrasekhar Bal, Venkatesh Rangarajan, Thomas Pfluger, Olga Kagna, Omar Alonso, Fatima K. Begum, Kahkashan Bashir Mir, Vincent Peter Magboo, Leon J Menezes, Diana Paez and Thomas Pascual

Publication title: Journal of Nuclear Medicine Technology, 2022

Abstract:

Introduction: 18F-FDG PET/CT whole-body tumor burden in lymphoma is not routinely performed due to the lack of fast quantification methods. Although the semi-automatic method

is fast, it still lacks the necessary speed required to quantify tumor burden in daily clinical practice.

Purpose: To evaluate the performance of the convolutional neural networks (CNN) software to localize neoplastic lesions in whole-body 18F-FDG PET/CT images of pediatric lymphoma patients.

Methods: This retrospective image data set, derived from the data pool under the IAEA (CRP# E12017), included 102 baseline staging 18F-FDG PET/CTs of pediatric lymphoma patients (mean age 11 yrs). Images were quantified to determine the whole-body (wb) tumor burden (wbMTV and wbTLG) using a semi-automatic (SEMI) software and CNN-based software. Both were displayed as wbMTVSEMI & wbTLGSEMI and wbMTVCNN & TLGCNN. The intraclass correlation coefficient (ICC) was applied to evaluate concordance between the CNN-based software and the SEMI software. **RESULTS:** Twenty-six patients were excluded from the analyses because the software was unable to perform calculations. In the remaining 76 patients, wbMTVCNN and wbMTVSEMI whole-body tumor burden metrics were highly correlated (ICC=0.993; 95%CI: 0.989 -0.996; p-value<0.0001) as were wbTLGCNN and wbTLGSEMI (ICC=0.999; 95%CI: 0.998-0.999; p-value<0.0001). However, the time spent calculating these metrics was significantly (<0.0001) faster by CNN (mean = 19 seconds; 11 - 50 seconds) compared to the semi-automatic method (mean = 21.6 minutes; 3.2 - 62.1 minutes), especially in patients with advanced disease.

Conclusion: Determining whole-body tumor burden in pediatric lymphoma patients using CNN is fast and feasible in clinical practice.

Full text available upon request to the author

Article title: Impact of COVID-19 Pandemic on Cardiovascular Testing in Asia

Authors: Takashi Kudo, MD, PHD, Ryan Lahey, MD, PHD, Cole B. Hirschfeld, MD, Michelle C. Williams, MBCHB, PHD, Bin Lu, MD, PHD, Mirvat Alasnag, MD, Mona Bhatia, MD, Hee-Seung Henry Bom, MD, PHD, Tairkhan Dautov, MD, Reza Fazel, MD, MSC, Ganesan Karthikeyan, MD, Felix Y.J. Keng, MBBS, Ronen Rubinshtein, MD, Nathan Better, MBBS, Rodrigo Julio Cerci, MD, Sharmila Dorbala, MD, MPH, Paolo Raggi, MD, Leslee J. Shaw, PHD, Todd C. Villines, MD, João V. Vitola, MD, PHD, Andrew D. Choi, MD, Eli Malkovskiy, Benjamin Goebel, BS, Yosef A. Cohen, BA, Michael Randazzo, MD, Thomas N.B. Pascual, MD, Yaroslav Pynda, MSC, Maurizio Dondi, MD, PHD, Diana Paez, MD, MED, Andrew J. Einstein, MD, PHD, on behalf of the INCAPS COVID Investigators Group

Publication title: JACC: Asia 1(2): 187-199, September 2021

Abstract:

Background

The coronavirus disease-2019 (COVID-19) pandemic significantly affected management of cardiovascular disease around the world. The effect of the pandemic on volume of cardiovascular diagnostic procedures is not known.

Objectives

This study sought to evaluate the effects of the early phase of the COVID-19 pandemic on cardiovascular diagnostic procedures and safety practices in Asia.

Methods

The International Atomic Energy Agency conducted a worldwide survey to assess changes in cardiovascular procedure volume and safety practices caused by COVID-19. Testing volumes were reported for March 2020 and April 2020 and were compared to those from March 2019. Data from 180 centers across 33 Asian countries were grouped into 4 subregions for comparison.

Results

Procedure volumes decreased by 47% from March 2019 to March 2020, showing recovery from March 2020 to April 2020 in Eastern Asia, particularly in China. The majority of centers cancelled outpatient activities and increased time per study. Practice changes included implementing physical distancing and restricting visitors. Although COVID testing was not commonly performed, it was conducted in one-third of facilities in Eastern Asia. The most severe reductions in procedure volumes were observed in lower-income countries, where volumes decreased 81% from March 2019 to April 2020.

Conclusions

The COVID-19 pandemic in Asia caused significant reductions in cardiovascular diagnostic procedures, particularly in low-income countries. Further studies on effects of COVID-19 on cardiovascular outcomes and changes in care delivery are warranted.

Full text available upon request to the author

Article title: Impact of COVID-19 on the imaging diagnosis of cardiac disease in Europe

Authors: Michelle Claire Williams, Leslee Shaw, Cole B. Hirschfeld, Pal Maurovich-Horvat, Bjarne L. Nørgaard, Gianluca Pontone, Amelia Jimenez-Heffernan, Valentin Sinitsyn, Vladimir Sergienko, Alexey Ansheles, Jeroen J Bax, Ronny Buechel, Elisa Milan, Riemer H J A Slart, Edward Nicol, Chiara Bucciarelli-Ducci, Yaroslav Pynda, Nathan Better, Rodrigo Cerci, Sharmila Dorbala, Paolo Raggi, Todd C Villines, Joao Vitola, Eli Malkovskiy, Benjamin Goebel, Yosef Cohen, Michael Randazzo, Thomas N B Pascual, Maurizio Dondi, Diana Paez, Andrew J Einstein, On behalf of INCAPS COVID Investigators Group

Publication title: Open Heart 8(2):e001681, August 2021

Abstract:

Objectives: We aimed to explore the impact of the COVID-19 pandemic on cardiac diagnostic testing and practice and to assess its impact in different regions in Europe.

Methods: The online survey organised by the International Atomic Energy Agency Division of Human Health collected information on changes in cardiac imaging procedural volumes between March 2019 and March/April 2020. Data were collected from 909 centres in 108 countries.

Results: Centres in Northern and Southern Europe were more likely to cancel all outpatient activities compared with Western and Eastern Europe. There was a greater reduction in total procedure volumes in Europe compared with the rest of the world in March 2020 (45% vs 41%, $p=0.003$), with a more marked reduction in Southern Europe (58%), but by April 2020 this was similar in Europe and the rest of the world (69% vs 63%, $p=0.261$). Regional variations were apparent between imaging modalities, but the largest reductions were in Southern Europe for nearly all modalities. In March 2020, location in Southern Europe was the only independent predictor of the reduction in procedure volume. However, in April 2020, lower gross domestic product and higher COVID-19 deaths were the only independent predictors.

Conclusion: The first wave of the COVID-19 pandemic had a significant impact on care of patients with cardiac disease, with substantial regional variations in Europe. This has potential long-term implications for patients and plans are required to enable the diagnosis of non-COVID-19 conditions during the ongoing pandemic.

Full text link <https://tinyurl.com/45krtuyx>

Article title: Reduction of cardiac imaging tests during the COVID-19 pandemic: The case of Italy. Findings from the IAEA Non-invasive Cardiology Protocol Survey on COVID-19 (INCAPS COVID)

Authors: Maurizio Dondi, Elisa Milan, Gianluca Pontone, Cole B.Hirschfeld, Michelle Williams, Leslee J. Shaw, Yaroslav Pynda, Paolo Raggi, Rodrigo Cerci, Joao Vitola, Nathan Better, Todd C. Villines, Sharmila Dorbala, Thomas N.B. Pascual, Raffaele Giubbini, Andrew J. Einstein, Diana Paez, on behalf of the INCAPS COVID Investigators Group

Publication title: International Journal of Cardiology 341(10230), August 2021

Abstract:

Background: In early 2020, COVID-19 massively hit Italy, earlier and harder than any other European country. This caused a series of strict containment measures, aimed at blocking the spread of the pandemic. Healthcare delivery was also affected when resources were diverted towards care of COVID-19 patients, including intensive care wards.

Aim of the study: The aim is assessing the impact of COVID-19 on cardiac imaging in Italy, compare to the Rest of Europe (RoE) and the World (RoW).

Methods: A global survey was conducted in May-June 2020 worldwide, through a questionnaire distributed online. The survey covered three periods: March and April 2020, and March 2019. Data from 52 Italian centres, a subset of the 909 participating centres from 108 countries, were analyzed.

Results: In Italy, volumes decreased by 67% in March 2020, compared to March 2019, as opposed to a significantly lower decrease ($p < 0.001$) in RoE and RoW (41% and 40%, respectively). A further decrease from March 2020 to April 2020 summed up to 76% for the

North, 77% for the Centre and 86% for the South. When compared to the RoE and RoW, this further decrease from March 2020 to April 2020 in Italy was significantly less ($p = 0.005$), most likely reflecting the earlier effects of the containment measures in Italy, taken earlier than anywhere else in the West.

Conclusions: The COVID-19 pandemic massively hit Italy and caused a disruption of healthcare services, including cardiac imaging studies. This raises concern about the medium- and long-term consequences for the high number of patients who were denied timely diagnoses and the subsequent lifesaving therapies and procedures.

Full text link <https://tinyurl.com/2fa7fdh5>

Article title: International Impact of COVID-19 on the Diagnosis of Heart Disease

Authors: Andrew J. Einstein, MD, PHD,^{a,b,c} Leslee J. Shaw, PHD,^d Cole Hirschfeld, MD,^b Michelle C. Williams, MBChB, PHD,^e Todd C. Villines, MD,^f Nathan Better, MB, BS,^g Joao V. Vitola, MD, PHD,^h Rodrigo Cerci, MD,^h Sharmila Dorbala, MD, MPH,ⁱ Paolo Raggi, MD, PHD,^j Andrew D. Choi, MD,^k Bin Lu, MD,^l Valentin Sinitsyn, MD, PHD,^m Vladimir Sergienko, MD, PHD,ⁿ Takashi Kudo, MD, PHD,^o Bjarne Linde Nørgaard, MD, PHD,^p Pál Maurovich-Horvat, MD, PHD, MPH,^q Roxana Campisi, MD,^r Elisa Milan, MD,^s Lizette Louw, MD,^t Adel H. Allam, MD,^u Mona Bhatia, MD,^v Eli Malkovskiy,^{a,b,w} Benjamin Goebel, BA,^d Yosef Cohen, BA,^x Michael Randazzo, MD,^b Jagat Narula, MD,^y Thomas N.B. Pascual, MD, MHPED,^z Yaroslav Pynda, MSC,^{aa} Maurizio Dondi, MD, PHD,^{aa} Diana Paez, MD, MED,^{aaon} behalf of the INCAPS COVID Investigators Group

Publication title: Journal of the American College of Cardiology 77(2), 2021

Abstract:

Background: The coronavirus disease 2019 (COVID-19) pandemic has adversely affected diagnosis and treatment of noncommunicable diseases. Its effects on delivery of diagnostic care for cardiovascular disease, which remains the leading cause of death worldwide, have not been quantified.

Objectives: The study sought to assess COVID-19's impact on global cardiovascular diagnostic procedural volumes and safety practices.

Methods: The International Atomic Energy Agency conducted a worldwide survey assessing alterations in cardiovascular procedure volumes and safety practices resulting from COVID-19. Noninvasive and invasive cardiac testing volumes were obtained from participating sites for March and April 2020 and compared with those from March 2019. Availability of personal protective equipment and pandemic-related testing practice changes were ascertained.

Results: Surveys were submitted from 909 inpatient and outpatient centers performing cardiac diagnostic procedures, in 108 countries. Procedure volumes decreased 42% from March 2019 to March 2020, and 64% from March 2019 to April 2020. Transthoracic echocardiography decreased by 59%, transesophageal echocardiography 76%, and stress tests 78%, which varied between stress modalities. Coronary angiography (invasive or computed tomography) decreased 55% ($p < 0.001$ for each procedure). In multivariable regression, significantly greater reduction in procedures occurred for centers in countries with lower gross domestic product. Location in a

low-income and lower-middle-income country was associated with an additional 22% reduction in cardiac procedures and less availability of personal protective equipment and telehealth.

Conclusions: COVID-19 was associated with a significant and abrupt reduction in cardiovascular diagnostic testing across the globe, especially affecting the world's economically challenged. Further study of cardiovascular outcomes and COVID-19-related changes in care delivery is warranted. (J Am Coll Cardiol 2021;77:173-85) © 2021 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation.

Full text link <https://tinyurl.com/4cnyhcup>

Article title: Impact of COVID-19 on nuclear medicine in Asia

Authors: Hee-Seung Henry Bom MD, PhD, FANMB, HFPSNM, Thomas N B Pascual MD, MHPed, FPSNM, Partha S.Choudhury MBBS, DRM, DNB (nuclear medicine), AkramAl-Ibraheem MD, JBNM, FEBNM, FANMB, DCBNC

Publication title: Seminars in Nuclear Medicine 52(1): 25-30, June 2021

Abstract:

Coronavirus disease 2019 (COVID-19) was first detected in China in late 2019 and rapidly spread to nearby Asian countries in early 2020. Outbreaks occurred differently in each country and affected nuclear medicine (NM) practice significantly even before the COVID-19 pandemic. The Asian NM community has worked together from the beginning of the pandemic. Fortunately, the Asian Regional Cooperative Council for Nuclear Medicine annual general meeting and Asia Nuclear Medicine Board examination was held in Manila from January 28 to February 2, 2020; these were the last face-to-face events of these organizations to date. Members shared information about COVID-19 at the conference, and through online means afterwards. Web-based surveys performed from March to April 2020 for the Asian Regional Cooperative Council for Nuclear Medicine and Asia Nuclear Medicine Board communities showed a significant reduction of NM practice and supply of radioisotopes (RI) at the beginning of the COVID-19 pandemic. A follow-up survey in March to April 2021 clearly showed the recovery of both NM practice and RI supplies. The pattern of recovery is variable according to institutions and countries. Herein, we have reported the case-in-point operational histories of four representative institutions in the East, Southeast, South, and West Asia. The second outbreak in India is ongoing on a worrisome scale. Various communications and educational sessions were actively performed online in the Asian NM community during the pandemic.

Full text available upon request to the author

Article title: Impact of COVID-19 on Cardiovascular Testing in the United States Versus the Rest of the World

Authors: Cole B. Hirschfeld, MD, Leslee J. Shaw, PHD, Michelle C. Williams, MBCHB, PHD, Ryan Lahey, MD, PHD, Todd C. Villines, MD, Sharmila Dorbala, MD, MPH, Andrew D. Choi, MD, Nishant R. Shah, MD, MPH, David A. Bluemke, MD, PHD, Daniel S. Berman, MD, Ron Blankstein, MD, Maros Ferencik, MD, PHD, Jagat Narula, MD, PHD, David Winchester, MD,

MS, Eli Malkovskiy, Benjamin Goebel, BS, Michael J. Randazzo, MD, Juan Lopez-Mattei, MD, Purvi Parwani, MBBS, MPH, Joao V. Vitola, MD, Rodrigo J. Cerci, MD, Nathan Better, MBBS, Paolo Raggi, MD, Bin Lu, MD, Vladimir Sergienko, MD, PHD, Valentin Sinitsyn, MD, Takashi Kudo, MD, PHD, Bjarne Linde Nørgaard, MD, PHD, Pál Maurovich-Horvat, MD, PHD, MPH, Yosef A. Cohen, Thomas N.B. Pascual, MD, Yaroslav Pynda, MSC, Maurizio Dondi, MD, Diana Paez, MD, Andrew J. Einstein, MD, PHD, on behalf of the INCAPS-COVID Investigators Group
Publication title: JACC: Cardiovascular Imaging 14(9), June 2021

Abstract:

Objectives: This study sought to quantify and compare the decline in volumes of cardiovascular procedures between the United States and non-US institutions during the early phase of the coronavirus disease-2019 (COVID-19) pandemic.

Background: The COVID-19 pandemic has disrupted the care of many non-COVID-19 illnesses. Reductions in diagnostic cardiovascular testing around the world have led to concerns over the implications of reduced testing for cardiovascular disease (CVD) morbidity and mortality.

Methods: Data were submitted to the INCAPS-COVID (International Atomic Energy Agency Non-Invasive Cardiology Protocols Study of COVID-19), a multinational registry comprising 909 institutions in 108 countries (including 155 facilities in 40 U.S. states), assessing the impact of the COVID-19 pandemic on volumes of diagnostic cardiovascular procedures. Data were obtained for April 2020 and compared with volumes of baseline procedures from March 2019. We compared laboratory characteristics, practices, and procedure volumes between U.S. and non-U.S. facilities and between U.S. geographic regions and identified factors associated with volume reduction in the United States.

Results: Reductions in the volumes of procedures in the United States were similar to those in non-U.S. facilities (68% vs. 63%, respectively; $p = 0.237$), although U.S. facilities reported greater reductions in invasive coronary angiography (69% vs. 53%, respectively; $p < 0.001$). Significantly more U.S. facilities reported increased use of telehealth and patient screening measures than non-U.S. facilities, such as temperature checks, symptom screenings, and COVID-19 testing. Reductions in volumes of procedures differed between U.S. regions, with larger declines observed in the Northeast (76%) and Midwest (74%) than in the South (62%) and West (44%). Prevalence of COVID-19, staff redeployments, outpatient centers, and urban centers were associated with greater reductions in volume in U.S. facilities in a multivariable analysis.

Conclusions: We observed marked reductions in U.S. cardiovascular testing in the early phase of the pandemic and significant variability between U.S. regions. The association between reductions of volumes and COVID-19 prevalence in the United States highlighted the need for proactive efforts to maintain access to cardiovascular testing in areas most affected by outbreaks of COVID-19 infection.

Full text link <https://tinyurl.com/4vrwdkdm>

Article title: Impact of COVID-19 on Diagnostic Cardiac Procedural Volume in Oceania: The IAEA Non-invasive Cardiology Protocol Survey on COVID-19 (INCAPS COVID)

Authors: Patricia O'Sullivan, MBBS, FRACP, John Younger, MBBCh, MRCP, FRACP, FRSANZ, Niels Van Pelt, MBChB, Sue O'Malley, MBBS, Dora Lenturut-Katal, MD, Cole B. Hirschfeld, MD, Joao V. Vitola, MD, PhD, Rodrigo Cerci, MD, Michelle C. Williams, MBChB, PhD, Leslee J. Shaw, PhD, Paolo Raggi, MD, PhD, Todd C. Villines, MD, Sharmila Dorbala, MD, MPHm, Andrew D. Choi, MD, Yosef Cohen, BA, Benjamin Goebel, BS, Eli Malkovskiy, Michael Randazzo, MDg, Thomas N.B. Pascual, MD, MHPedq, Yaroslav Pynda, MSc, Maurizio Dondi, MD, PhD, Diana Paez, MD, Andrew J. Einstein, MD, PhD, Nathan Better, MBBS, FRACP, on behalf of the INCAPS COVID Investigators Group

Publication title: Heart, Lung and Circulation 30(10), May 2021

Abstract:

Objectives The INCAPS COVID Oceania study aimed to assess the impact caused by the COVID-19 pandemic on cardiac procedure volume provided in the Oceania region.

Methods: A retrospective survey was performed comparing procedure volumes within March 2019 (pre-COVID-19) with April 2020 (during first wave of COVID-19 pandemic). Sixty-three (63) health care facilities within Oceania that perform cardiac diagnostic procedures were surveyed, including a mixture of metropolitan and regional, hospital and outpatient, public and private sites, and 846 facilities outside of Oceania. The percentage change in procedure volume was measured between March 2019 and April 2020, compared by test type and by facility.

Results: In Oceania, the total cardiac diagnostic procedure volume was reduced by 52.2% from March 2019 to April 2020, compared to a reduction of 75.9% seen in the rest of the world ($p < 0.001$). Within Oceania sites, this reduction varied significantly between procedure types, but not between types of health care facility. All procedure types (other than stress cardiac magnetic resonance [CMR] and positron emission tomography [PET]) saw significant reductions in volume over this time period ($p < 0.001$). In Oceania, transthoracic echocardiography (TTE) decreased by 51.6%, transoesophageal echocardiography (TOE) by 74.0%, and stress tests by 65% overall, which was more pronounced for stress electrocardiograph (ECG) (81.8%) and stress echocardiography (76.7%) compared to stress single-photon emission computerized tomography (SPECT) (44.3%). Invasive coronary angiography decreased by 36.7% in Oceania.

Conclusion: A significant reduction in cardiac diagnostic procedure volume was seen across all facility types in Oceania and was likely a function of recommendations from cardiac societies and directives from government to minimize spread of COVID-19 amongst patients and staff. Longer term evaluation is important to assess for negative patient outcomes which may relate to deferral of usual models of care within cardiology.

Full text link <https://tinyurl.com/mjattwkb>

Article title: Coronavirus (COVID-19) pandemic mediated changing trends in nuclear medicine education and training: time to change and scintillate

Authors: Gopinath Gnanasegaran, Diana Paez, Mike Sathekge, Francesco Giammarile, Stefano Fanti, Arturo Chiti, Henry Bom, Sobhan Vinjamuri, Thomas NB Pascual, Jamshed Bomanji

Publication title: European Journal of Nuclear Medicine and Molecular Imaging 49(4), March 2021

Abstract:

No abstract available

Full text link <https://tinyurl.com/25yc3hzw>

Article title: Impact of the first wave of coronavirus disease 2019 (COVID-19) pandemic on the diagnosis of heart disease in the Russian Federation: results from the Russian segment of the IAEA INCAPS COVID study

Authors: Ansheles A. A., Sergienko V. B., Sinitsyn V. E., Vakhromeeva M. N., Kokov A. N., Zavadovsky K. V., Ryzhkova D. V., Karalkin A. V., Shurupova I. V., Pospelov V. A., Migunova E. V., Sayfullina G. B., Dariy O. Yu., Zhuravlev K. N., Itskovich I. E., Gagarina N. V., Hirschfeld C., Williams M. C., Shaw L. J., Malkovskiy E., Better N., Cerci R., Dorbala Sh., Pascual T. N. B., Raggi P., Villines T., Vitola J. V., Pynda Y., Dondi M., Paez D., Einstein A. J. on behalf of the INCAPS COVID research group

Publication title: Russian Journal of Cardiology 26(1):4276, February 2021

Abstract:

Aim. To assess the impact of the first wave of coronavirus disease 2019 (COVID-19) pandemic on the diagnosis of heart disease in the Russian Federation.

Material and methods. Fifteen Russian medical centers from 5 cities took part in an online survey organized by the Division of Human Health of the International Atomic Energy Agency (IAEA), containing questions regarding alterations in cardiovascular procedure volumes resulting from COVID-19 in March-April 2020.]\

Results. A number of outpatients undergoing cardiac diagnostic procedures was noted in 80% of clinics. Cardiovascular procedure volumes in the period from March 2019 to March 2020 in general decreased by 9,5%, and from March 2019 to April 2020, by 56,5%. Stress electrocardiography decreased by 38,4%, stress echocardiography by 72,5%, stress single-photon emission computed tomography by 66,9%, computed tomography angiography by 49,7%, magnetic resonance imaging by 42,7%, invasive coronary angiography by 40,7%. The decrease in diagnostic procedure volumes in selected regions (Tomsk Oblast, Kemerovo Oblast, Tatarstan) was not so pronounced compared to Moscow and St. Petersburg (-20,7%, -75,2%, -93,8% in April 2020, respectively, $p < 0,001$).

Conclusion. The first wave of the COVID-19 pandemic caused a sharp decrease in the number of diagnostic cardiac procedures in Russia. This has potential longterm implications for patients with cardiovascular disease. Understanding these implications can help guide diagnostic strategies during the ongoing COVID-19 pandemic and minimize the future losses.

Full text link <https://tinyurl.com/ysn9etwz>

Article title: International Impact of COVID-19 on the Diagnosis of Heart Disease

Authors: Andrew J. Einstein, MD, PHD, Leslee J. Shaw, PHD, Cole Hirschfeld, MD, Michelle C. Williams, MBCHB, PHD, Todd C. Villines, MD, Nathan Better, MB, BS, Joao V. Vitola, MD, PHD, Rodrigo Cerci, MD, Sharmila Dorbala, MD, MPH, Paolo Raggi, MD, PHD, Andrew D. Choi, MD, Bin Lu, MD, Valentin Sinitsyn, MD, PHD, Vladimir Sergienko, MD, PHD, Takashi Kudo, MD, PHD, Bjarne Linde Nørgaard, MD, PHD, Pál Maurovich-Horvat, MD, PHD, MPH, Roxana Campisi, MD, Elisa Milan, MD, Lizette Louw, MD, Adel H. Allam, MD, Mona Bhatia, MD, Eli Malkovskiy, Benjamin Goebel, BA, Yosef Cohen, BA, Michael Randazzo, MD, Jagat Narula, MD, Thomas N.B. Pascual, MD, MHPED, Yaroslav Pynda, MSC, Maurizio Dondi, MD, PHD, Diana Paez, MD, MED, on behalf of the INCAPS COVID Investigators Group

Publication title: Journal of the American College of Cardiology 7(22), January 2021

Abstract:

Background: The coronavirus disease 2019 (COVID-19) pandemic has adversely affected diagnosis and treatment of noncommunicable diseases. Its effects on delivery of diagnostic care for cardiovascular disease, which remains the leading cause of death worldwide, have not been quantified.

Objectives: The study sought to assess COVID-19's impact on global cardiovascular diagnostic procedural volumes and safety practices.

Methods: The International Atomic Energy Agency conducted a worldwide survey assessing alterations in cardiovascular procedure volumes and safety practices resulting from COVID-19. Noninvasive and invasive cardiac testing volumes were obtained from participating sites for March and April 2020 and compared with those from March 2019. Availability of personal protective equipment and pandemic-related testing practice changes were ascertained.

Results: Surveys were submitted from 909 inpatient and outpatient centers performing cardiac diagnostic procedures, in 108 countries. Procedure volumes decreased 42% from March 2019 to March 2020, and 64% from March 2019 to April 2020. Transthoracic echocardiography decreased by 59%, transesophageal echocardiography 76%, and stress tests 78%, which varied between stress modalities. Coronary angiography (invasive or computed tomography) decreased 55% ($p < 0.001$ for each procedure). In multivariable regression, significantly greater reduction in procedures occurred for centers in countries with lower gross domestic product. Location in a low-income and lower-middle-income country was associated with an additional 22% reduction in cardiac procedures and less availability of personal protective equipment and telehealth.

Conclusions: COVID-19 was associated with a significant and abrupt reduction in cardiovascular diagnostic testing across the globe, especially affecting the world's economically

challenged. Further study of cardiovascular outcomes and COVID-19-related changes in care delivery is warranted.

Full text link <https://tinyurl.com/58azydjx>

Article title: Worldwide Variation in the Use of Nuclear Cardiology Camera Technology, Reconstruction Software, and Imaging Protocols

Authors: Cole B. Hirschfeld MD, Mathew Mercuri PhD, Thomas N. B. Pascual MD, Ganesan Karthikeyan MD, João V. Vitol aMD, PhD, John J. Mahmarian MD, Nathan Better MD, Salah E. Bouyoucef MD, Henry Hee-Seung Bom MD, PhD, Vikram Lele MD, V. Peter C. Magboo MD, Erick Alexánderson MD, Adel H. Allam MD, Mouaz H. Al-Mallah MD, MS, Sharmila Dorbala MD, MPH, Albert Flotats MD, Scott Jerome DO, Philipp A .Kaufmann MD, Osnat Luxemburg MD, MPH, MBA, Leslee J. Shaw PhD, S. Richard Underwood MD, Madan M. Rehani PhD, Diana Paez MD, Maurizio Dondi MD, Andrew J. Einstein MD, PhD, on behalf of the INCAPS Investigators Group

Publication title: JACC: Cardiovascular Imaging 14(9): 1819-1828, September 2021

Abstract:

Objectives

This study sought to describe worldwide variations in the use of myocardial perfusion imaging hardware, software, and imaging protocols and their impact on radiation effective dose (ED).

Background

Concerns about long-term effects of ionizing radiation have prompted efforts to identify strategies for dose optimization in myocardial perfusion scintigraphy. Studies have increasingly shown opportunities for dose reduction using newer technologies and optimized protocols.

Methods

Data were submitted voluntarily to the INCAPS (International Atomic Energy Agency Nuclear Cardiology Protocols Study) registry, a multinational, cross-sectional study comprising 7,911 imaging studies from 308 labs in 65 countries. The study compared regional use of camera technologies, advanced post-processing software, and protocol characteristics and analyzed the influence of each factor on ED.

Results

Cadmium-zinc-telluride and positron emission tomography (PET) cameras were used in 10% (regional range 0% to 26%) and 6% (regional range 0% to 17%) of studies worldwide. Attenuation correction was used in 26% of cases (range 10% to 57%), and advanced post-processing software was used in 38% of cases (range 26% to 64%). Stress-first single-photon emission computed tomography (SPECT) imaging comprised nearly 20% of cases from all world regions, except North America, where it was used in just 7% of cases. Factors associated with lower ED and odds ratio for achieving radiation dose ≤ 9 mSv included use of cadmium-zinc-telluride, PET, advanced post-processing software, and stress- or rest-only

imaging. Overall, 39% of all studies (97% PET and 35% SPECT) were ≤ 9 mSv, while just 6% of all studies (32% PET and 4% SPECT) achieved a dose ≤ 3 mSv.

Conclusions

Newer-technology cameras, advanced software, and stress-only protocols were associated with reduced ED, but worldwide adoption of these practices was generally low and varied significantly between regions. The implementation of dose-optimizing technologies and protocols offers an opportunity to reduce patient radiation exposure across all world regions.

Full text available upon request to the author

Article title: Impact of COVID-19 Pandemic on Diagnostic Cardiac Procedural Volume in Oceania: The IAEA Non-invasive Cardiology Protocol Survey on COVID-19

Authors: P. O'Sullivan

J. Younger, N. Van Pelt, S. O'Malley, D. Lenturut-Katal, C. Hirschfeld, J. Vitola, R. Cerci, M. Williams, L. Shaw, P. Raggi, T. Villines, S. Dorbala, A. Choi, Y. Cohen, B. Goebel, E. Malkovskiy, M. Randazzo, T. Pascual, Y. Pynda, M. Dondi, D. Paez, A. Einstein, N. Better

Publication title: Heart, Lung and Circulation 30:S191, January 2021

Abstract:

Coronavirus disease 2019 (COVID-19) has had a significant impact on healthcare provision globally. The INCAPS COVID multicentre, international survey assessed the impact of the pandemic on cardiac diagnostic centres worldwide.

Full text available upon request to the author

Article title: Sequential 18F-fluorodeoxyglucose positron emission tomography (18F-FDG PET) scan findings in patients with extrapulmonary tuberculosis during the course of treatment—a prospective observational study

Authors: Jamshed Bomanji, Rajnish Sharma, Bhagwant R. Mittal, Sanjay Gambhir, Ahmad Qureshy, Shamim M. F. Begum, Diana Paez, Mike Sathekge, Mariza Vorster, Dragana Sobic Saranovic, Pawana Pusuwan, Vera Mann, Sobhan Vinjamuri, Alimuddin Zumla, Thomas N. B. Pascual

Publication title: European Journal of Nuclear Medicine and Molecular Imaging 47(265), December 2020

Abstract:

Background: Initial studies of tuberculosis (TB) in macaques and humans using 18F-FDG positron emission tomography (PET) imaging as a research tool suggest its usefulness in localising disease sites and as a clinical biomarker. Sequential serial scans in patients with extrapulmonary TB (EPTB) could inform on the value of PET-CT for monitoring response to treatment and defining cure.

Patients and methods: HIV-negative adults with EPTB from eight sites across six countries had three 18F-FDG PET/CT scans: (i) within 2 weeks of enrolment, (ii) at 2 months into TB treatment and (iii) at end of ATT treatment. Scanning was performed according to the EANM guidelines. 18F-FDG PET/CT scans were performed 60 ± 10 min after intravenous injection of 2.5–5.0 MBq/kg of 18F-FDG.

Findings: One hundred and forty-seven patients with EPTB underwent 3 sequential scans. A progressive reduction over time of both the number of active sites and the uptake level (SUVmax) at these sites was seen. At the end of WHO recommended treatment, 53/147 (36.0%) patients had negative PET/CT scans, and 94/147 (63.9%) patients remained PET/CT positive, of which 12 patients had developed MDR TB. One died of brain tuberculoma.

Interpretation: Current 18F-FDG PET/CT imaging technology cannot be used clinically as a biomarker of treatment response, cure or for decision-making on when to stop EPTB treatment. PET/CT remains a research tool for TB and further development of PET/CT is required using new Mycobacterium tuberculosis-specific radiopharmaceuticals targeting high-density surface epitopes, gene targets or metabolic pathways.

Full text link <https://tinyurl.com/yckuzatj>

Article title: Worldwide Diagnostic Reference Levels for Single-Photon Emission Computed Tomography Myocardial Perfusion Imaging: Findings From INCAPS

Authors: Cole B. Hirschfeld, Maurizio Dondi, Thomas N. B. Pascual, Mathew Mercuri, Joao Vitola, Ganesan Karthikeyan, Nathan Better, John J. Mahmarian, Salah E. Bouyoucef, Henry Hee-Seung Bom, Vikram Lele, Vincent Peter C. Magboo, Erick Alexánder, Adel H. Allam, Mouaz H. Al-Mallah, Albert Flotats, Scott Jerome, Philipp A. Kaufmann, Osnat Luxenburg, S Richard Underwood, Madan M. Rehani, Jenia Vassileva, Diana Paez, Andrew J. Einstein, INCAPS Investigators Group

Publication title: JACC Cardiovasc Imaging 14(3): 657-665, August 2020

Abstract:

Objectives: This study sought to establish worldwide and regional diagnostic reference levels (DRLs) and achievable administered activities (AAAs) for single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI).

Background: Reference levels serve as radiation dose benchmarks to compare individual laboratories against aggregated data, helping to identify sites in greatest need of dose reduction interventions. DRLs for SPECT MPI have previously been derived from national or regional registries. To date there have been no multiregional reports of DRLs for SPECT MPI from a single standardized dataset.

Methods: Data were submitted voluntarily to the INCAPS (International Atomic Energy Agency Nuclear Cardiology Protocols Study), a cross-sectional, multinational registry of MPI

protocols. A total of 7,103 studies were included. DRLs and AAAs were calculated by protocol for each world region and for aggregated worldwide data.

Results: The aggregated worldwide DRLs for rest-stress or stress-rest studies employing technetium Tc 99m-labeled radiopharmaceuticals were 11.2 mCi (first dose) and 32.0 mCi (second dose) for 1-day protocols, and 23.0 mCi (first dose) and 24.0 mCi (second dose) for multiday protocols. Corresponding AAAs were 10.1 mCi (first dose) and 28.0 mCi (second dose) for 1-day protocols, and 17.8 mCi (first dose) and 18.7 mCi (second dose) for multiday protocols. For stress-only technetium Tc 99m studies, the worldwide DRL and AAA were 18.0 mCi and 12.5 mCi, respectively. Stress-first imaging was used in 26% to 92% of regional studies except in North America where it was used in just 7% of cases. Significant differences in DRLs and AAAs were observed between regions.

Conclusions: This study reports reference levels for SPECT MPI for each major world region from one of the largest international registries of clinical MPI studies. Regional DRLs may be useful in establishing or revising guidelines or simply comparing individual laboratory protocols to regional trends. Organizations should continue to focus on establishing standardized reporting methods to improve the validity and comparability of regional DRLs.

Full text available upon request to the author

Article title: Global Impact of COVID-19 on Nuclear Medicine Departments: An International Survey in April 2020

Authors: Lutz S. Freudenberg, Diana Paez, Francesco Giammarile, Julian Cerci, Moshe Modiselle, Thomas N.B. Pascual, Noura El-Haj, Pilar Orellana, Yaroslav Pynda, Ignasi Carrió, Stefano Fanti, Cristina Matushita, and Ken Herrmann

Publication title: Journal of Nuclear Medicine 61(9), July 2020

Abstract:

Introduction: The coronavirus disease 2019 (COVID-19) pandemic has placed significant challenges on health care systems worldwide, whether in the preparation, response, or recovery phase of the pandemic. This has been primarily managed by dramatically reducing in- and outpatient services for other diseases and implementing infection prevention and control (IPC) measures. The impact of the pandemic on nuclear medicine departments and their services has not yet been established. The aim of this online survey was to evaluate the impact of COVID-19 on nuclear medicine departments.

Materials and Methods: A web-based questionnaire, made available from April 16 to May 3, 2020, was designed to determine the impact of the pandemic on in- and out-patient nuclear medicine departments; including the number of procedures, employee health, availability of radiotracers and other essential supplies, and availability of personal protective equipment (PPE). The survey also enquired about operational aspects and types of facilities, as well as other challenges.

Results: A total of 434 responses from 72 countries were registered and analysed. Respondents reported an average decline of 54% in diagnostic procedures. Positron emission tomography / computed tomography (PET/CT) scans decreased by an average of 36%, while sentinel lymph-node procedures decreased by 45%, lung scans by 56%, bone scans by 60%, myocardial studies by 66%, and thyroid studies by 67%. Out of all participating centres, 81% perform radionuclide therapies, and they reported a reduction of 45% on average in the last four weeks, ranging from over 76% in Latin America and South East Asia to 16% in South Korea and Singapore. Survey results showed that 52% of participating sites limited their ^{99m}Tc/⁹⁹Mo generator purchases and 12% of them temporarily cancelled orders. Insufficient supplies of essential materials (radioisotopes, generators, and kits) were reported, especially for ^{99m}Tc/⁹⁹Mo generators and ¹³¹I, particularly in Africa, Asia, and Latin America.

Conclusion: Both diagnostic and therapeutic nuclear medicine procedures declined precipitously with countries worldwide being affected by the pandemic to a similar degree. Countries that were in the post-peak phase of the pandemic when they responded to the survey, such as South Korea and Singapore reported a less pronounced impact on nuclear medicine services however, the overall results of the survey showed that nuclear medicine services worldwide had been significantly impacted. In relation to staff health, 15% of respondents experienced COVID-19 infections within their own departments

Full text available upon request to the author

Article title: PET/CT features of Extrapulmonary Tuberculosis at first clinical presentation - a cross-sectional observational ¹⁸F-FDG imaging study across six countries

Authors: Jamshed Bomanji, Rajnish Sharma, Bhagwant R. Mittal, Sanjay Gambhir, Ahmad Qureshy, Shamim M.F. Begum, Diana Paez, Mike Sathekge, Mariza Vorster, Dragana Sobic Saranovic, Pawana Pusuwan, Vera Mann, Sobhan Vinjamuri, Alimuddin Zumla, Thomas N.B. Pascual for the International Atomic Energy Agency Extra-pulmonary TB Consortium

Publication title: European Respiratory Journal 55(2) December 2019

Abstract:

Background: A large proportion of the huge global burden of Extrapulmonary tuberculosis (EPTB) are treated empirically without accurate definition of disease sites, and extent of multi-organ disease involvement. Positron emission tomography (PET) imaging using ¹⁸F-FDG in TB could be a useful imaging technique for localising disease sites and extent of disease.

Methods: We conducted a study of HIV-negative adult patients with a new clinical diagnosis of EPTB across 8 centres located in 6 countries: India, Pakistan, Thailand, South Africa, Serbia, and Bangladesh to assess the extent of disease and common sites involved at first presentation. ¹⁸F-FDG PET/CT scans were performed within 2 weeks of presentation.

Findings: A total of 358 patients with EPTB (189 females; 169 males) were recruited over 45 months. Age range 18-83 years (females: median 30 years; males: median 38 years). 350/358 (98%) patients (183 female, 167 male) had positive scan. 118/350 (33.7%) had a single extrapulmonary site and 232/350 (66.3%) had more than one site (organ) affected. Lymph nodes, skeletal, pleura and brain were common sites. 100/358 (28%) of EPTB patients had

18F-FDG PET/CT positive sites in the lung. 110 patients were 18F-FDG PET/CT positive in more body sites than were noted clinically at first presentation and 160 patients had the same number of positive body sites.

Interpretation: 18F-FDG PET/CT scan has potential for further elucidating the spectrum of disease, pathogenesis of EPTB, and monitoring the effects of treatment on active lesions over time, and requires longitudinal cohort studies, twinned with biopsy and molecular studies.

Full text available upon request to the author

Article title: Is True Whole-body FDG-PET/CT required in pediatric lymphoma? An IAEA Multicentre Prospective Study

Authors: Juliano J. Cerci1, Elba C. Etchebehere, Helen Nadel, Anita Brink, Chandrasekhar S. Bal, Venkatesh Rangarajan, Thomas Pfluger, Olga Kagna, Omar Alonso, Fatima K. Begum, Kahkashan Bashir Mir, Vincent P. Magboo, Leon J. Menezes, Diana Paez, and Thomas N. Pascual

Publication title: Journal of Nuclear Medicine 60(8), January 2019

Abstract:

Guidelines recommend true whole-body 18F-FDG PET/CT scans from vertex to toes in pediatric lymphoma patients, although this suggestion has not been validated in large clinical trials. The objective of the study was to evaluate the incidence and clinical impact of lesions outside the "eyes to thighs" regular field of view (R-FOV) in 18F-FDG PET/CT staging (sPET) and interim (iPET) scans in pediatric lymphoma patients. Methods: True whole-body sPET and iPET scans were prospectively obtained in pediatric lymphoma patients (11 worldwide centers). Expert panel central review of sPET and iPET scans were evaluated for lymphoma lesions outside the R-FOV and clinical relevance of these findings. Results: A total of 610 scans were obtained in 305 patients. The sPET scans did not show lesions outside the R-FOV in 91.8% of the patients, whereas in 8.2% patients the sPET scans demonstrated lesions also outside the R-FOV (soft tissue, bone, bone marrow, and skin); however, the presence of these lesions did not change the clinical stage of any patient and did not affect treatment decision. Among the 305 iPET scans, there were no new positive 18F-FDG-avid lesions outside the R-FOV, when compared with their paired sPET scans. A single lesion outside the R-FOV on iPET occurred in 1 patient (0.3%), with the primary lesion diagnosed in the femur on sPET that persisted on iPET. Conclusion: The identification of additional lesions outside the R-FOV (eyes to thighs) using 18F-FDG PET/CT has no impact in the definition of the clinical stage of disease and minimal impact in the treatment definition of patients with pediatric lymphoma. As so, R-FOV for both sPET and iPET scans could be performed.

Full text link <https://tinyurl.com/sf4j8sxz>

Article title: Challenges using PET-CT for international multicentre coordinated research projects in developing countries

Authors: Bhoil, Amita, Ferdousi Begum, Shamim M., Vinjamuri, Sobhan, Bomanji, Jamshed, Pascual, Thomas, on behalf of IAEA CRP (E15021) group

Publication title: Nuclear Medicine Communications 40(2):1, November 2018

Abstract:

No available abstract

Full text available upon request to the author

Article title: The IAEA Human Health Campus: Online Educational Resource for Health Care Professionals in Radiation Medicine

Authors: R. Núñez Miller, T. Gray, T. Pascual, E. Estrada, F. Giammarile, D. Paez

Publication title: Journal of Global Oncology 4, October 2018

Abstract:

Background: Cognizant of the educational needs of the member states, and taking advantage of the current technological advances in this digital age, the International Atomic Energy Agency (IAEA) officially launched in 2010 the Human Health Campus (HHC; <http://humanhealth.iaea.org>), which is an online educational resource initiative geared toward enhancing professional knowledge of health professionals in radiation medicine.

Aim: Determine how and by whom the IAEA HHC is being visited and used since its inception in October 2010.

Methods: Using the information provided by Google Analytics, determine the overall key performance indicators (KPIs) such as total sessions, total users, total page views, session duration, including daily number of visits to the HHC, county of origin, evaluation of the most popular sections and source of the traffic.

Results: Since its launch on October 6th, 2010, KPIs are as follows: total sessions 374,279, total users 243,195, total page views 1,393,310, pages/session 3.72, average session duration 00:03:08. % of new sessions 64.92%. The HHC has witnessed continual growth year on year (YoY) in total sessions (visits) since its inception in October 2010, and total users. For 2016 (the highest performing year so far) there were 201 visits/day, 40% increase in traffic YoY and 20% user growth. Traffic to the Webinar content has seen sustained growth in the number of YoY since being introduced to the HHC in 2013. 2016 saw the largest increase of over +600%. E-Learning modules have also seen growth in the traffic YoY since being introduced to the HHC in 2011. The year 2015 saw a large increase in total traffic with over +95%. E-Learning traffic accounts for almost 25% of all traffic to the Nuclear Medicine section. Visits by mobile devices have increased YoY exponentially since the launch of the HHC, with the mobile traffic growing strong through 2015-2016 with an increase of 5482 sessions, or an 81% uplift YoY. For 2017, it represented 18% of the total traffic (from 3% in 2012). There is a clear prevalence of desktop users (85.5%), as the preferred method of browsing the HHC. A total of 210 countries and overseas territories have visited the HHC. The United States is the largest contributor of traffic from a global perspective with 16.31% of total traffic, almost double the next largest which is the UK with 9.10%. India with 5.45% and Australia with 3.27% of total traffic, respectively, round out the top 4. Not surprisingly, more than 60% of users are from English-speaking countries. Spanish is the second most popular language of users with just over 6% of total traffic. Conclusion: The HHC is an

IAEA open access Web based educational resource for professionals in the field of radiation medicine being visited by as many as 210 countries. The upward trend in its use suggests that the IAEA HHC will continue to be an important player in providing educational resources for professionals worldwide.

Full text available upon request to the author

Article title: Inter-reader variability of SPECT MPI readings in low- and middle-income countries: Results from the IAEA-MPI Audit Project (I-MAP)

Authors: Maurizio Dondi, MD, Carlo Rodella, MSc, Raffaele Giubbini, MD, Luca Camoni, BSc, Ganesan Karthikeyan, MD, DM, MSc, Joao V. Vitola, MD, Andrew J. Einstein, MD, PhD, FASNC, Bertjan J. Arends, MSc, Olga Morozova, BA, MA, Thomas N. Pascual, MD, MHPED, and Diana Paez, MD, MsED on behalf of the I-MAP investigators

Publication title: Journal of Nuclear Cardiology 27(Suppl 1), August 2018

Abstract:

Background

Consistency of results between different readers is an important issue in medical imaging, as it affects portability of results between institutions and may affect patient care. The International Atomic Energy Agency (IAEA) in pursuing its mission of fostering peaceful applications of nuclear technologies has supported several training activities in the field of nuclear cardiology (NC) and SPECT myocardial perfusion imaging (MPI) in particular. The aim of this study was to verify the outcome of those activities through an international clinical audit on MPI where participants were requested to report on studies distributed from a core lab.

Methods

The study was run in two phases: in phase 1, SPECT MPI studies were distributed as raw data and full processing was requested as per local practice. In phase 2, images from studies pre-processed at the core lab were distributed. Data to be reported included summed stress score (SSS); summed rest score (SRS); summed difference score (SDS); left ventricular (LV) ejection fraction (EF) and end-diastolic volume (EDV). Qualitative appraisals included the assessment of perfusion and presence of ischemia, scar or mixed patterns, presence of transient ischemic dilation (TID), and risk for cardiac events (CE). Twenty-four previous trainees from low- and middle-income countries participated (core participants group) and their results were assessed for inter-observer variability in each of the two phases, and for changes between phases. The same evaluations were performed for a group of eleven international experts (experts group). Results were also compared between the groups.

Results

Expert readers showed an excellent level of agreement for all parameters in both phase 1 and 2. For core participants, the concordance of all parameters in phase 1 was rated as good to excellent. Two parameters which were re-evaluated in phase 2, namely SSS and SRS, showed an increased level of concordance, up to excellent in both cases. Reporting of categorical variables

by expert readers remained almost unchanged between the two phases, while core participants showed an increase in phase 2. Finally, pooled LVEF values did not show a significant difference between core participants and experts. However, significant differences were found between LVEF values obtained using different software packages for cardiac analysis.

Conclusions

In this study, inter-observer agreement was moderate-to-good for core group readers and good-to-excellent for expert readers. The quality of reporting is affected by the quality of processing. These results confirm the important role of the IAEA training activities in improving imaging in low- and middle-income countries.

Full text available upon request to the author

Article title: Implementation of Quality Systems in Nuclear Medicine: Why It Matters. An Outcome Analysis (Quality Management Audits in Nuclear Medicine Part III)

Authors: Maurizio Dondi, Diana Paez, Leonel Torres, Mario Marengo, Angelika Bischof Delaloye, Kishor Solanki, Annare Van Zyl Ellmann, Enrique Estrada Lobato, Rodolfo Nunez Miller, Francesco Giammarile, and Thomas Pascual

Publication title: Seminars in Nuclear Medicine 48(3), February 2018

Abstract:

The International Atomic Energy Agency (IAEA) developed a comprehensive program-Quality Management Audits in Nuclear Medicine (QUANUM). This program covers all aspects of nuclear medicine practices including, but not limited to, clinical practice, management, operations, and services. The QUANUM program, which includes quality standards detailed in relevant checklists, aims at introducing a culture of comprehensive quality audit processes that are patient oriented, systematic, and outcome based. This paper will focus on the impact of the implementation of QUANUM on daily routine practices in audited centers. Thirty-seven centers, which had been externally audited by experts under IAEA auspices at least 1 year earlier, were invited to run an internal audit using the QUANUM checklists. The external audits also served as training in quality management and the use of QUANUM for the local teams, which were responsible of conducting the internal audits. Twenty-five out of the 37 centers provided their internal audit report, which was compared with the previous external audit. The program requires that auditors score each requirement within the QUANUM checklists on a scale of 0-4, where 0-2 means nonconformance and 3-4 means conformance to international regulations and standards on which QUANUM is based. Our analysis covering both general and clinical areas assessed changes on the conformance status on a binary manner and the level of conformance scores. Statistical analysis was performed using nonparametric statistical tests. The evaluation of the general checklists showed a global improvement on both the status and the levels of conformances ($P < 0.01$). The evaluation of the requirements by checklist also showed a significant improvement in all, with the exception of Hormones and Tumor marker determinations, where changes were not significant. Of the 25 evaluated institutions, 88% (22 of 25) and 92% (23 of 25) improved their status and levels of conformance, respectively. Fifty-five

requirements, on average, increased from nonconformance to conformance status. In 8 key areas, the number of improved requirements was well above the average: Administration & Management (checklist 2); Radiation Protection & Safety (checklist 4); General Quality Assurance system (checklist 6); Imaging Equipment Quality Assurance or Quality Control (checklist 7); General Diagnostic (checklist 9); General Therapeutic (checklist 12); Radiopharmacy Level 1 (checklist 14); and Radiopharmacy Level 2 (checklist 15). Analysis of results related to clinical activities showed an overall positive impact on both the status and the level of conformance to international standards. Similar results were obtained for the most frequently performed clinical imaging and therapeutic procedures. Our study shows that the implementation of a comprehensive quality management system through the IAEA QUANUM program has a positive impact on nuclear medicine practices.

Full text link <https://tinyurl.com/2kcaa6dp>

Article title: Impact of age on the selection of nuclear cardiology stress protocols: The INCAPS (IAEA nuclear cardiology protocols) study

Authors: Mouaz H. Al-Mallah, Thomas N.B. Pascual, Mathew Mercuri, Diana Paez, Andrew J. Einstein, The INCAPS Investigators Group

Publication title: International Journal of Cardiology 259, February 2018

Abstract:

Background: There is growing concern about radiation exposure from nuclear myocardial perfusion imaging (MPI), particularly among younger patients who are more prone to develop untoward effects of ionizing radiation, and hence US and European professional society guidelines recommend age as a consideration in weighing radiation risk from MPI. We aimed to determine how patient radiation doses from MPI vary across age groups in a large contemporary international cohort.

Methods: Data were collected as part of a global cross-sectional study of centers performing MPI coordinated by the International Atomic Energy Agency (IAEA). Sites provided information on each MPI study completed during a single week in March-April 2013. We compared across age groups laboratory adherence to pre-specified radiation-related best practices, radiation effective dose (ED; a whole-body measure reflecting the amount of radiation to each organ and its relative sensitivity to radiation's deleterious effects), and the proportion of patients with $ED \leq 9$ mSv, a target level specified in guidelines.

Results: Among 7911 patients undergoing MPI in 308 laboratories in 65 countries, mean ED was 10.0 ± 4.5 mSv with slightly higher exposure among younger age groups (trend p value < 0.001). There was no difference in the proportion of patients with $ED \leq 9$ mSv across age groups, or in adherence to best practices based on the median age of patients in a laboratory.

Conclusions: In contemporary nuclear cardiology practice, the age of the patient appears not to impact protocol selection and radiation dose, contrary to professional society guidelines.

Full text available upon request to the author

Article title: Interim PET/CT Predicts Response in Pediatric Lymphoma Patients - Report of an IAEA Multicenter Prospective Study

Authors: Helen Nadel, Elba C Etchebehere, Juliano Julio Cerci, Anita Brink, Chandrasekhar S. Bal, Venkatesh Rangarajan, Thomas Pfluger, Olga Kagna, Omar Alonso, Fatima Begum, Kahkashan Bashir Mir, Vincent P Magboo, Leon Menezes, Diana Paez, Thomas Neil B. Pascual

Publication title: SSRN Electronic Journal, January 2018

Abstract:

Background: PET/CT is well established as method for prognostic stratification in adult Hodgkin (HL) and Non-Hodgkin lymphoma (NHL). In pediatric lymphoma, there is no uniform system of prognostic stratification. This study evaluates the prognosis of interim FDG-PET/CT in HL and NHL pediatric patients in a large multicenter population from low-middle, upper-middle and high income countries.

Methods: Eleven worldwide centers prospectively performed FDG-PET/CT studies on pediatric patients for staging and interim response evaluation. Clinical and PET/CT findings, events, and mortality data were collected. Expert panel performed central review of baseline and interim FDG-PET/CT examinations visually with Lugano classification (LC) and semi-quantitatively (including SUVmax and Delta SUVmax). LC scores of 1, 2, 3 and X were considered negative (LC-); LC scores 4 and 5 were considered positive (LC+). Prognostic analysis compared the 2-y event-free survival (EFS) rate to the PET2 results, and clinical data.

Findings: Whole-body FDG-PET/CT acquisitions were performed in 250 patients (183 males; mean age = 10 ± 4 years; 70% with Hodgkin lymphoma) with clinical stage I-IV represented. There were 9 deaths and 46 events during follow-up and 194 (78%) patients with LC- interim studies. LC studies were significantly and independently associated with increased overall mortality (HR=8.96; $p=0.002$) and more events (HR 5.80; $p<0.001$). At multivariate analysis neither Delta SUV nor SUVmax were predictor of events. LC studies were associated with more events in children with HL (HR=9.77; $p<0.001$) than in NHL (HR 2.41; $p=0.10$).

Interpretation: LC FDG-PET/CT scan at interim evaluation is an independent predictor of OS and EFS in pediatric lymphoma patients. LC studies are able to independently predict decreased EFS in patients with HL but not patients with NHL.

Full text link <https://tinyurl.com/55d7a3jn>

Article title: Nuclear cardiology practices and radiation exposure in Africa: Results from the IAEA Nuclear Cardiology Protocols Study (INCAPS)

Authors: Salah E. Bouyoucef, Mathew Mercuri, Thomas N.B. Pascual, Adel H. Allam, Mboyo Vangu, João V. Vitola, Nathan Better, Ganesan Karthikeyan, John J. Mahmarian, Madan M. Rehani, Ravi Kashyap, Maurizio Dondi, Diana Paez, Andrew J. Einstein, for the INCAPS investigators group

Publication title: Cardiovascular journal of South Africa: official journal for Southern Africa, September 2017

Abstract:

Objective: While nuclear myocardial perfusion imaging (MPI) offers many benefits to patients with known or suspected cardiovascular disease, concerns exist regarding radiation associated health effects. Little is known regarding MPI practice in Africa. We sought to characterize radiation doses and the use of MPI best practices that could minimize radiation in African nuclear cardiology laboratories, and compare these to practice worldwide.

Methods Demographics and clinical characteristics were collected for a consecutive sample of 348 patients from 12 laboratories in six African countries over a one-week period from March to April 2013. Radiation effective dose (ED) was estimated for each patient. A quality index (QI) enumerating adherence to eight best practices, identified a priori by an IAEA expert panel, was calculated for each laboratory. We compared these metrics with those from 7 563 patients from 296 laboratories outside Africa. Results to that of the rest of the world [9.1 (5.1–15.6) vs 10.3 mSv (6.8–12.6), $p = 0.14$], although a larger proportion of African patients received a low ED, ≤ 9 mSv targeted in societal recommendations (49.7 vs 38.2%, $p < 0.001$). Best practice adherence was higher among African laboratories (QI score: 6.3 ± 1.2 vs 5.4 ± 1.3 , $p = 0.013$). However, median ED varied significantly among African laboratories (range: 2.0–16.3 mSv; $p < 0.0001$) and QI range was 4–8.

Conclusion Patient radiation dose from MPI in Africa was similar to that in the rest of the world, and adherence to best practices was relatively high in African laboratories. Nevertheless there remain opportunities to further reduce radiation exposure to African patients from MPI.

Full text link <https://tinyurl.com/ywekw4rb>

Article title: Comprehensive Auditing in Nuclear Medicine Through the International Atomic Energy Agency Quality Management Audits in Nuclear Medicine (QUANUM) Program. Part 1: the QUANUM Program and Methodology

Authors: Maurizio Dondi MD, Leonel Torres PhD, Mario Marengo PhD, Teresa Massardo MD, Eyal Mishani PhD, Annare Van Zyl Ellmann MD, Kishor Solanki MD, Angelika Bischof Delaloye MD, Enrique Estrada Lobato MD, Rodolfo Nunez Miller MD, Diana Paez MD, Thomas Pascual MD, MPHED

Publication title: Seminars in Nuclear Medicine 47(6): 680-686, November 2017

Abstract:

An effective management system that integrates quality management is essential for a modern nuclear medicine practice. The Nuclear Medicine and Diagnostic Imaging Section of the International Atomic Energy Agency (IAEA) has the mission of supporting nuclear medicine practice in low- and middle-income countries and of helping them introduce it in their health-care system, when not yet present. The experience gathered over several years has shown diversified levels of development and varying degrees of quality of practice, among others because of limited professional networking and limited or no opportunities for exchange of

experiences. Those findings triggered the development of a program named Quality Management Audits in Nuclear Medicine (QUANUM), aimed at improving the standards of NM practice in low- and middle-income countries to internationally accepted standards through the introduction of a culture of quality management and systematic auditing programs. QUANUM takes into account the diversity of nuclear medicine services around the world and multidisciplinary contributions to the practice. Those contributions include clinical, technical, radiopharmaceutical, and medical physics procedures. Aspects of radiation safety and patient protection are also integral to the process. Such an approach ensures consistency in providing safe services of superior quality to patients. The level of conformance is assessed using standards based on publications of the IAEA and the International Commission on Radiological Protection, and guidelines from scientific societies such as Society of Nuclear Medicine and Molecular Imaging (SNMMI) and European Association of Nuclear Medicine (EANM). Following QUANUM guidelines and by means of a specific assessment tool developed by the IAEA, auditors, both internal and external, will be able to evaluate the level of conformance. Nonconformances will then be prioritized and recommendations will be provided during an exit briefing. The same tool could then be applied to assess any improvement after corrective actions are taken. This is the first comprehensive audit program in nuclear medicine that helps evaluate managerial aspects, safety of patients and workers, clinical practice, and radiopharmacy, and, above all, keeps them under control all together, with the intention of continuous improvement.

Full text available upon request to the author

Article title: Comprehensive Auditing in Nuclear Medicine Through the International Atomic Energy Agency Quality Management Audits in Nuclear Medicine Program. Part 2: Analysis of Results

Authors: Maurizio Dondi,MD, Leonel Torres, PhD, Mario Marengo, PhD, Teresa Massardo, MD, Eyal Mishani, PhD, Annare Van Zyl Ellmann,MD, Kishor Solanki,MD, Angelika Bischof Delaloye,MD, Enrique Estrada Lobato, MD, Rodolfo Nunez Miller,MD, Felix Barajas Ordonez, MD, Diana Paez, MD, and Thomas Pascual, MD, MPHEd

Publication title: Seminars in Nuclear Medicine 47(6), July 2017

Abstract:

The International Atomic Energy Agency has developed a program, named Quality Management Audits in Nuclear Medicine (QUANUM), to help its Member States to check the status of their nuclear medicine practices and their adherence to international reference standards, covering all aspects of nuclear medicine, including quality assurance/quality control of instrumentation, radiopharmacy (further subdivided into levels 1, 2, and 3, according to complexity of work), radiation safety, clinical applications, as well as managerial aspects. The QUANUM program is based on both internal and external audits and, with specifically developed Excel spreadsheets, it helps assess the level of conformance (LoC) to those previously defined quality standards. According to their level of implementation, the level of conformance to requested standards; 0 (absent) up to 4 (full conformance). Items scored 0, 1, and 2 are

considered non-conformance; items scored 3 and 4 are considered conformance. To assess results of the audit missions performed worldwide over the last 8 years, a retrospective analysis has been run on reports from a total of 42 audit missions in 39 centers, three of which had been re-audited. The analysis of all audit reports has shown an overall LoC of $73.9 \pm 8.3\%$ (mean \pm standard deviation), ranging between 56.6% and 87.9%. The highest LoC has been found in the area of clinical services (83.7% for imaging and 87.9% for therapy), whereas the lowest levels have been found for Radiopharmacy Level 2 (56.6%); Computer Systems and Data Handling (66.6%); and Evaluation of the Quality Management System (67.6%). Prioritization of non-conformances produced a total of 1687 recommendations in the final audit report. Depending on the impact on safety and daily clinical activities, they were further classified as critical (requiring immediate action; $n = 276$; 16% of the total); major (requiring action in relatively short time, typically from 3 to 6 months; $n = 604$; 36%); whereas the remaining 807 (48%) were classified as minor, that is, to be addressed whenever possible. The greatest proportion of recommendations has been found in the category "Managerial, Organization and Documentation" (26%); "Staff Radiation Protection and Safety" (17.3%); "Radiopharmaceuticals Preparation, Dispensing and Handling" (15.8%); and "Quality Assurance/Quality Control" and "Management of Equipment and Software" (11.4%). The lowest level of recommendations belongs to the item "Human Resources" (4%). The QUANUM program proved applicable to a wide variety of institutions, from small practices to larger centers with PET/CT and cyclotrons. Clinical services rendered to patients showed a good compliance with international standards, whereas issues related to radiation protection of both staff and patients will require a higher degree of attention. This is a relevant feedback for the International Atomic Energy Agency with regard to the effective translation of safety recommendations into routine practice. Training on drafting and application of standard operating procedures should also be considered a priority.

Full text link <https://tinyurl.com/2s3edr3f>

Article title: Nuclear Cardiology: Are We Using the Right Protocols and Tracers the Right Way?

Authors: Maurizio Dondi, Thomas Pascual, Diana Paez & Andrew J. Einstein

Publication title: American Journal of Cardiovascular Drugs 17(9), April 2017

Abstract:

The field of nuclear cardiology has changed considerably over recent years, with greater attention paid to safety and radiation protection issues. The wider usage of technetium-99m (Tc-99m)-labeled radiopharmaceuticals for single-photon emission computed tomography (SPECT) imaging using gamma cameras has contributed to better quality studies and lower radiation exposure to patients. Increased availability of tracers and scanners for positron emission tomography (PET) will help further improve the quality of studies and quantify myocardial blood flow and myocardial flow reserve, thus enhancing the contribution of non-invasive imaging to the management of coronary artery disease. The introduction of new instrumentation such as solid state cameras and new software will help reduce further radiation exposure to patients undergoing nuclear cardiology studies. Results from recent studies, focused on assessing the relationship between best practices and radiation risk, provide useful

insights on simple measures to improve the safety of nuclear cardiology studies without compromising the quality of results.

Full text available upon request to the author

Article title: Worldwide variation in the use of nuclear cardiology camera technology, reconstruction software, and acquisition protocols: findings from the IAEA Nuclear Cardiology Protocols Study

Authors: Edward A. Hulten, Mathew Mercuri, Thomas Pascual, Joao Vitola, Nathan Better, Ganesan Karthikeyan, John Mahmarian, Madan Rehani, Maurizio Dondi, Diana Paez, Andrew Jeffrey Einstein

Publication title: Journal of the American College of Cardiology 69(11):1587, March 2017

Abstract:

Background: Although increasing attention has been drawn to medical radiation exposure, little is reported about worldwide variation in nuclear myocardial perfusion imaging (MPI) techniques that may result in differences in radiation exposure. The IAEA Nuclear Cardiology Protocols Study (INCAPS) was initiated to evaluate such differences.

Methods: Observational cross-sectional study of all MPI studies conducted at 308 nuclear cardiology laboratories in 65 countries during a single week in March–April 2013. We evaluated camera technology, reconstruction software and acquisition protocols used and their association with MPI radiation exposure.

Results: 7911 studies were included. Stress only protocols (10% of MPI), rest only protocols (4%), multiple position imaging (7%), attenuation correction (26%), avoidance of thallium (95%), advanced software processing (38%), CZT camera (10%), and PET imaging (6%) were associated with significantly lower radiation dose. Of all lab variables evaluated (Table 1), avoidance of thallium, CZT camera, and stress or rest only protocols had the largest effect size for association with radiation exposure.

Conclusions: Our findings demonstrate variable and overall low worldwide adoption of IAEA recommended best nuclear Cardiology practices. Nearly all sites have succeeded in avoidance of thallium imaging. Adherence to best practices, even low cost solutions such as multiple position imaging, could reduce worldwide radiation exposure during nuclear MPI.

Full text available upon request to the author

Article title: Nuclear Cardiology Practice in Asia: Analysis of Radiation Exposure and Best Practice for Myocardial Perfusion Imaging — Results From the IAEA Nuclear Cardiology Protocols Cross-Sectional Study (INCAPS) —

Authors: Thomas N.B. Pascual, MD; Mathew Mercuri, PhD; Noura El-Haj; Henry Hee-Sung Bom, MD, PhD; Vikram Lele, MD; Mouaz H. Al-Mallah, MD; Osnat Luxenburg, MD; Ganesan Karthikeyan, MD; Joao Vitola, MD, PhD; John J. Mahmarian, MD; Nathan Better, MD; Leslee J.

Shaw, PhD; Madan M. Rehani, PhD; Ravi Kashyap, MD; Diana Paez, MD; Maurizio Dondi, MD; Andrew J. Einstein, MD, PhD for the INCAPS Investigators Group

Publication title: Circulation Journal 81(4), February 2017

Abstract:

Background: This paper examines the current status of radiation exposure to patients in myocardial perfusion imaging (MPI) in Asia.

Methods and Results: Laboratories voluntarily provided information on MPI performed over a 1-week period. Eight best practice criteria regarding MPI were predefined by an expert panel. Implementation of ≥ 6 best practices (quality index [QI] ≥ 6) was pre-specified as a desirable goal for keeping radiation exposure at a low level. Radiation effective dose (ED) in 1,469 patients and QI of 69 laboratories in Asia were compared against data from 239 laboratories in the rest of the world (RoW). Mean ED was significantly higher in Asia (11.4 vs. 9.6 mSv; $P < 0.0001$), with significantly lower doses in South-East vs. East Asia (9.7 vs. 12.7 mSv; $P < 0.0001$). QI in Asia was lower than in RoW. In comparison with RoW, Asian laboratories used thallium more frequently, used weight-based technetium dosing less frequently, and trended towards a lower rate of stress-only imaging.

Conclusions: MPI radiation dose in Asia is higher than that in the RoW and linked to less consistent use of laboratory best practices such as avoidance of thallium, weight-based dosing, and use of stress-only imaging. Given that MPI is performed in Asia within a diverse array of medical contexts, laboratory-specific adoption of best practices offers numerous opportunities to improve quality of care.

Full text link <https://tinyurl.com/2p8ssauf>

Article title: Improving Nuclear Medicine Practices in Cardiology in the Emerging Economies: Role of the International Atomic Energy Agency

Authors: Maurizio Dondi, Thomas Pascual, Diana Paez

Publication title: International Journal of Cardiovascular Sciences 31(1), January 2017

Abstract:

Low- and middle-income countries (LMICs) are particularly affected by cardiovascular diseases (CVDs), as more than 75% of all CVD deaths occur in these countries. Global prognostic figures are alarming, as an estimated 23.6 million people will die each year due to CVDs by 2030. For this reason, one of the targets of the Sustainable Development Goals (SDGs) of the agenda of the United Nations (UN) aims at reducing premature mortality due to Non-Communicable Diseases (NCDs) by 30% by 2030. Within the UN family, the International Atomic Energy Agency (IAEA) has the mandate to promote safe, secure and peaceful use of nuclear technologies. The IAEA is strongly committed to accomplish the 2030 UN Agenda and through its Human Health Division, contribute to the attainment of SDGs. One of the key objectives of the Human Health Division is to support Member States to tackle the burden of CVDs through its subprogram of Nuclear Medicine and Diagnostic Imaging. This is accomplished by supporting the establishment and strengthening of capabilities of Member States to provide

appropriate and safe use of nuclear cardiology clinical applications. The support ranges from assisting countries in the planning and implementation stages, providing training, maintaining and improving quality of clinical practice, establishing quality management systems and advising on how to comply with international standards, as well as using the technology in an appropriate and safe manner. This review will cover the activities of the IAEA in promoting, implementing, and supporting nuclear applications in cardiology in LMICs.

Full text link <https://tinyurl.com/yckrwbxa>

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