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Book of Abstracts



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The use of Piperine from Black Pepper as a template in the design and synthesis of *potential anti-infective agents*

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Piperine is the naturally occurring alkaloid that gives the spice, black pepper its characteristic biting taste. Piperine is extracted from *Piper nigrum*, Linn. It is medicinally used as an anti-inflammatory, antioxidant, anticonvulsant, anti-bacterial, anti-tumor, analgesic, antipyretic and for hepatoprotective activities (Patil, U. K., 2011). Studies have shown that piperine decreases the effect of aflatoxin, a cancer causing substances, and reduces the risk of liver disease. Recent medical studies have shown piperine to be useful in increasing the absorption of certain vitamins and minerals such as selenium, vitamin B, beta-carotene, curcumin, amino acid and blood sugar (Singh, A., 2009). Extraction and purification of piperine was performed, yellow-pale yellow crystals of piperine was obtained with a yield of 6.7%. For the characterization of piperine the following data was collected: retardation factor (Rf) and UV. The Rf value was found to be 0.55 and 0.27 for TLC. The UV spectra of the compound have shown the presence of aromatic C-H stretching at $3\ 000\ \text{cm}^{-1}$, symmetry and asymmetry stretching of C=C at $1\ 633\ \text{cm}^{-1}$; $1\ 611\ \text{cm}^{-1}$, aromatic of C=C (benzene ring) at $1\ 580\ \text{cm}^{-1}$, $1\ 446\ \text{cm}^{-1}$. The proposed research is focusing on the extraction of the active agent, piperine, from black pepper. The active agent will then be used as a template in the synthesis of new potential anti-effective agents. The parent natural product and its analogues will then be tested for antimicrobial and antimalarial activity. So far about 5g of pure piperine was extracted from black pepper, currently I am busy with the synthesis of piperine analogues which was started on 04 September 2013.

The petrography and mineralogy of calc-silicate rocks in the Goanikontes area, Southern Central Zone, Damara Orogeny, Namibia.

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The studied area is located on the Goanikontes Farm, within the vicinity of the great Swakop River. The area lies within the high-temperature-low-pressure southern Central Zone, on the western extension of the Damara Belt, and is characterized by abundant granite intrusions. The Goanikontes area consist of a significantly attenuated but recognizable, deformed Damaran sequence of Etusis, Khan, Rossing and Chuos Formations. The entire sequence contains calc-silicate rock bands within gneisses, mica schists and marbles. This paper presents results of the research carried out on the classification of calc-silicate rocks occurring in the study area, from

which twelve samples were collected and later prepared for X-ray and petrographic analyses. Calc-silicates are a group of metamorphic rocks with little or no carbonate, occurring as reaction zones, along marble- metapelitic layers contacts or between marble and granite intrusions at contact metamorphism as a result of the process of metasomatism. Calc-silicates are classified using two classification schemes: (1) the British Geological Survey (BGS) metamorphic rocks classification scheme, using mineralogical quantifiers in addition to their root name, (2) the nomenclature of metacarbonate rocks and related rocks, based on the Calcium and magnesium content. Calc-silicate rocks in the study area were observed to be largely of regional metamorphism origin although a few skarns were also observed in the area as well. The latter belong to the low-pressure and high temperature, which is in compliance with the observed metamorphic grade in the Goanikontes area rocks. The results show that, the dominant mineral in these rocks are anorthite and hornblende. The following minerals were also present: Diopside, augite, actinolite, K-feldspar, plagioclase, quartz, grossular, meiotite and prehnite. The mineral associations and regional distribution of calc-silicate rocks from the Goanikontes area indicate regional metamorphic conditions of origin.

An analysis of the levels of food insecurity (food access) in Windhoek: A case study of the Okahandja Park informal settlement

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Given the rapid rate of urbanization in Southern Africa, a considerable population growth in cities is expected over the coming decades shifting the challenges of poverty, undernutrition and food insecurity to urban areas. In the urban context the problems of food insecurity is much more about what people can afford rather than how much they can eat. This research focuses on one of the informal settlements of Windhoek, Okahandja Park and demonstrates that income is a critical determinant of food accessibility and dietary quality. Using the Probit regression, the study shows that employment which in turn determines income and subsequent the ability to access food is important. It was further revealed that almost all households interviewed were severely food insecure because most household members were not working or earned meager incomes to afford nutritious meals. In the informal settlements the poor resort to borrowing food, going to bed hungry or consuming smaller means as means to survival. However the real solution lies in addressing urban poverty and subsequent food insecurity.

Modelling stated preferences of mode of travel by air travellers

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Air transport has always been considered as a very special sector in the international context. It facilitates global economic and social growth, International and domestic tourism and world trade growth. Currently, in Namibia the practiced airline industry is full service and Air Namibia is full service and Air Namibia is known of massive bail outs over the years. Full services high ticket prices give less opportunity to middle and low income groups to travel by air. Apart from Full Cost Carrier (FSC), there exists a cheaper airline industry (LCC). The two types of carriers, FSC and LCC, give passengers a choice to decide which carrier they prefer to fly. According to research many passengers prefer LCC than FSC due to ticket fare differences. The main objective of the study is to model the stated preference and its determinants based on passengers preference in order to inform the right airline industry for passengers in Namibia. Specifically the study focused on modeling the stated preference of air travelers in Namibia, investigated the determinants that inform the stated preferences based on passengers profiles assess Namibian air travelers stated preferences based on their profiles and compare different models used in analyzing stated preference and inform the appropriate air industry in Namibia. Given that stated preference or discrete choice models have been used to determine likely response to economic goods, the significance of the study was thus to inform the most likely form of airlines that will be applicable to Namibian air industry, perhaps advice Air Namibia an ideal form that will maximize profits and divert from bankruptcy. Two types of models mdels were fit. Binary choice models and latent class models were fit to estimate factors typically associated with air travelers' preferences. The study highlight the usefulness of passengers stated preferences when it comes to their decisions to fly. The results show that majority of the sampled passengers prefer LCC specially for domestic flights than FSC and this controverts the current operation in the country which is FSC. It is of great need the Namibian airline industry to consider LCC intended for passengers presences.

Risk factors for malaria transmission in Engela District, of the Ohangwena region of Northern Namibia

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Malaria transmission in Namibia has declined dramatically from 477,786 in 2000 to 1546 cases in the 2012/13 malaria season. The National Malaria Control Program (NMCP) adopted a strategy in 2010 to eliminate malaria from Namibia by the year 2020 (Nat. Mal. M&E Plan, 2010). This presents new challenges as interventions that were successful in bringing down malaria cases may no longer be appropriate at low transmission settings. New tools and interventions are required to move to zero local transmission of malaria. RDT confirmed malaria cases reported from the 17 clinics in the Engela district were recruited for this study and all fever individuals testing malaria positive by RDT were visited at their homes and interviewed about malaria risk factors. Four surrounding households were also selected and recruited into the study and this constituted a neighbourhood. Twenty six malaria cases were reported including 4 death cases. Out of the 22 cases reported, 10 individuals had a history of travelling outside of the district. Forty four percent of households reported having a breeding site close to the sleeping structures. Thirty four percent of the houses did not have mosquito nets and almost seventy two percent of all sleeping structures had a space between the roof and the wall. Nineteen percent of structures were sprayed while eighty percent were not sprayed. Importation of malaria is a major risk factor for malaria transmission in Engela district as persons travelling are potential reservoirs of the disease in their communities. The low usage of mosquito nets and low IRS coverage, poses a real challenge to stopping malaria transmission. Health check-ups following travelling to malaria-endemic areas should be made a priority.

Research Project in Astronomy - Opportunities for Namibia

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Due to its superior dark and cloudless night-sky conditions, Namibia is not only experiencing an increasing amount of Astro-tourism, but has also been hosting the world-leading Cherenkov telescope system H.E.S.S. (High Energy Stereoscopic System) for 11 years. Observing very high energy gamma-radiation from the most violent processes in the Universe, the four H.E.S.S. telescopes of 12m diameter each have recently been named one of the 10 most influencing observatories worldwide. With the inauguration of the fifth telescope with a diameter of 28m in 2012, H.E.S.S. is entering its second phase by employing an unprecedented level of sensitivity and energy coverage.

At the same time, the planning of the successor observatory CTA (Cherenkov Telescope Array) is shifting to full pace. During the past years, a thorough investigation for the best location world-wide to host this system of about 130 telescopes, spread over 10km², has been conducted. Recently, it was found, that the scientifically best place will be in Southern Namibia.

Additionally, the hugest telescope project on Earth, the SKA (Square Kilometre Array), operating in the radio regime and finally deploying telescopes with a reflective area of 1km², will

be build in Southern Africa. With the core array being situated in South Africa, the SKA will spread out over the whole subcontinent: 4 stations of about 60 telescopes of 15m diameter each, will be build in Namibia during the second phase of the project.

In this context, an overview of the current situation will be given and by this, the Namibian opportunities to participate in cutting-edge world-leading astronomical research will be stressed.

Factors affecting utilization of maternal health care services in Namibia

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Maternal health care service is one of the most effective health interventions for preventing maternal mortality and it gives opportunities for providing relevant health information and services that are significant to the promotion of the health of both the women and their infants. The absence of knowledge on the factors that affect and influence utilization can be very damning to any society as this may hinder the development and implementation of policies to improve accessibility and utilization of maternal health care services by all women of the reproductive age. The aim of this study was to determine the main factors that affect utilization of maternal health care services (MHCS) in Namibia using the 2007-2006 Namibian Demographic and Health Survey (NDHS). The study used logistic regression analysis and chi-square tests to assess the determinants of utilization of maternal health care utilization. Results show that 96.1% of the women had at least one antenatal visit during their last pregnancy while only 81% had given birth at a health facility. The results further indicate strong association between antenatal care visits and marital status, exposure to media, birth order, family wealth index and the education level of the woman. Significant associations also exist between the place of delivery and exposure to media, occupation status, marital status, education level, wealth index and the birth order.

Dust bathing behaviours of elephants, zebras and wildebeest and the potential risk of inhalational anthrax in Etosha national park

Barandongo, Z. and Mfuno JKE

Ingestion of soil-borne spores of *Bacillus anthracis* by wildlife and domestic herbivores while grazing has been regarded as the primary mode of anthrax infection. Biting flies are also considered to transmit *B. anthracis* cutaneously. Inhalation of *B. anthracis* spores from activities such as dust bathing has often been suggested as a possible route. However, there is no empirical evidence to support that hypothesis.

The present study will be carried out to determine the seasonality of dust bathing behaviours of zebras, wildebeest and elephants, to determine whether seasonal peaks in dust bathing behaviour

correlate with peaks in anthrax cases for zebras, wildebeest and elephants, to document age and sex of dust bathing herbivores, to assess whether the age and sex of dust bathing individuals correlate with the age and sex of anthrax mortalities of herbivores from the mortality records of Etosha National Park ENP and finally to determine whether *B. anthracis* spores are present in dust bath sites of herbivores.

In the study motion triggered cameras will be positioned at selected dust bathing sites of zebras and wildebeest while elephant dust and mud bathing behaviours will be obtained through direct visual observations. Presence or absence of *B. anthracis* in soils collected at dust and mud bathing sites will be determined through laboratory culturing of using polymyxin-lysozyme-EDTA-thallos acetate (PLET) agar

Data analysis will be done using various tests such as normality test; Komorogov-Smirnov test; Two-way analysis of variance; linear regression and contingency table analysis logistic regression for various data collected and finally Kruskal Wallis if the data is not normally distributed

A time series analysis of the rainfall and temperature patterns of Windhoek, Keetmanshop, Rundu, Ondangwa and Grootfontein from 1950-2012

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The changes in rainfall and temperature patterns have caused lots of crisis in Namibia, lives have been lost and property damaged beyond repair. The aim of this study is to predict future values for monthly rainfall and temperature for the five coming years. This study will alert Namibians the changes of rainfall and temperatures patterns and the Namibia Meteorological Services to adopt a statistical model for predicting weather. Time series analysis was used for predicting future values, Regression analysis was used to check if there is an association between temperature and rainfall and ANOVA for comparing means between different stations. The result shows that rainfall is expected to decrease for the coming years.

A statistical analysis of voluntary counseling and testing (VCT) data to determine the HIV risk factors for HIV prevention in Namibia

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In an effort to provide information that can guide prevention strategies, this paper determined the risk determinants of HIV infection in Namibia and estimated the potential for HIV prevention

using attributable risk fractions. The study adopted a cross sectional research design with a sample of 14296 VCT clients from Oshana, Khomas and Kavango regions of Namibia for the period of 2009 to 2012. A multivariate logistic regression analysis was used to compute relative risks- measures of disease risk associated with various factors. For risk factors which are amenable to intervention, the Population Attributable Risk Percent (PAR %) was computed. The magnitudes of PAR% were then used as the basis for selecting risk factors that pose the greatest health threat to the population for prioritization in combination HIV programming. From a targeting perspective, sex, condom use, marital status, region of residence, male circumcision status, age and level of education were found to be significant predictors of HIV infection. Alcohol use was not associated with HIV infection in these regions. Among these risk factors, not using condoms and not being circumcised for men are amenable to intervention and interventions that eliminate exposure to these risk factors can avert up to 22% and 19% of the disease burden respectively assuming all other conditions remain the same.

Distributed algorithm for an electronic voting system

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In this paper, we present the design, requirements and implementation of a distributed algorithm for an electronic voting system. The Distributed Algorithm for an Electronic Voting System (DAEV) provides voters with high availability, more tolerate, more scalable, more reliable, reduces costs of conducting elections and it is easy to manage and monitor the electoral process. Firstly, the Distributed Algorithm for an Electronic System uses distributed database architecture to provide data services to all its clients. A distributed database is a single logical database that is spread physically across computers in multiple locations that are connected through the network. Distributed database architecture requires multiple instances of a database management system (or several DBMS) to run at several locations. The major objective of having a Distributed Database is to have access to data at multiple locations.

Secondly, the Distributed Algorithm for an Electronic System has a data replication feature which allows the copying of data that has manipulated or altered from one server to another server and provides high availability. Data Replication helps the system to recover from data failover performs erecting of a new master server in case of failover. Data Replication is a proven reliable and mature solution for scaling and delivering High Availability of Databases. Data Replication provides these advantages reliability, fast response, node decoupling, reduce network traffic at prime time and load distribution.

Furthermore, the system has a distributed algorithm which is responsible for the validation of data, sending of messages between the servers and the voting system. The algorithm is also responsible for determining the candidates to display for the voters and displaying other details.

Basically, determining from which province and constituency the voter is from so as to display the right candidates for parliament candidates.

Groundwater recharge estimation for perched aquifers in the Ohangwena region using the chloride mass balance and the soil water balance model (MODBIL)

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Ground water recharge estimation into perched aquifers was determined using the chloride mass balance and the soil water balance model (MODBIL) in this thesis. A complete literature studies was done using the published and unpublished literature from various sources. The recharge estimation obtained was then compared to previous studies done in the area and in areas with the same amount of rainfall averages as the Ohangwena region.

Villages in the Ohangwena region were sampled randomly for soil and water. The aquifers evaluated for recharge were the perched aquifers which are discontinuous aquifers located at shallow depths. Water samples were taken to the laboratory for hydrochemistry and the soil samples were collected for the eluates and grain size analysis.

The recharge into the perched aquifer ranges from 11 mm/a- 113 mm/a, this recharge differ with regards to the different seasons and the time of sampling. It is higher during the raining seasons and lowest during the winter months.

The recharge estimation into the perched aquifer of the Ohangwena is done to give clearance with regards to the amount of water available for the inhabitants in the area as both the human and livestock use this water for survival.

Activated carbon production, characterization and applications from Eendunga (Hyphaenepetersiana) for water treatment.

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Activated carbon from eendunga (*Hyphaenepetesiana*) has been successfully produced through chemical activation process using phosphoric acid as activating agent and carbonization temperatures (250°C, 300°C, 450°C), where carbonization occurred first followed by impregnation with different phosphoric acid solutions of 45%, 50%, 55% and also H₂O by weight. The adsorption capacity test of the produced activated carbon was determined by iodine number, where the carbons showed high capacity for adsorption of iodine. Their moisture and ash content, pH values, and its applications in water treatment were also studied. The activated carbon produced was also compared to both granular commercially produced AC. Eendunga

carbonizes at low temperatures other than other seeds. Temperatures higher than 350°C, cause lots of ash to form though.

Population structure and recruitment patterns of the indigenous mussel *Perna perna* and the alien mussel *Mytilus galloprovincialis* on the central and southern coast of Namibia
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Invasive species can disrupt ecosystems and are often able to consume resources and eventually outcompete indigenous species. This has been well documented for the Mediterranean mussel *Mytilus galloprovincialis* in a variety of locations around the world. *M. galloprovincialis* is able to outcompete and displace native mussels and become the dominant mussel species in certain localities. This is because it may grow faster than native mussels and be more tolerant to air exposure.

This study will assess the spatial and temporal population dynamics of the indigenous mussel *P. perna* in relation to the population dynamics of the alien mussel *M. galloprovincialis* and determine how temperature and dissolved oxygen concentrations may affect the distribution, abundance and biomass condition of *P. perna* and *M. galloprovincialis*. In addition the study will assess the patterns of succession on two rocky shores of Namibia; on the central coast (off Walvis Bay) and on the southern coast (off Lüderitz). The study will be conducted along Dolphin Beach near Walvis Bay and at a rocky shore in the vicinity of Lüderitz. Sampling will take place during spring tide once every season during October 2013 (spring), January 2014 (summer), April 2014 (autumn) and July 2014 (winter). Digital photographs will be taken of all the sites every second month.

Analysis of marine biotoxins, paralytic shellfish poisoning (psp) and diarrhetic shellfish poisoning toxins (DSP) in mussels, (*Mytilus galloprovincialis*) along central namibian and luderitz coastlines

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The study was carried out at four stations along the central Namibian and Lüderitz coastlines to assess the presence of shellfish marine biotoxins in mussels *Mytilus galloprovincialis*. Paralytic shellfish Poisoning (PSP) and Diarrhetic Shellfish Poisoning (DSP) toxins were monitored including water samples were collected from the same stations for phytoplankton analysis. Samples were collected using randomized sampling techniques during winter and summer months, from May 2012 to April 2013. Mussel samples were analyzed by Mouse bioassay (MBA) for PSP and Liquid chromatography with mass spectrometer (LC-MC) linked to an Agilent 1200 HPLC. PSP toxicity over ten times the European Union (EU) regulatory limit of 80

$\mu\text{g STX eq./100g}$ was observed in one of the Lüderitz samples while the first time to detect PSP reaching regulatory limit for central coast, specifically in Walvis Bay as other three station did not detect PSP at all. The DSP toxin profile determined by LC-MS was found to be composed primarily of Okadaic acid (OA), and dinophysistoxins-1 (DTX-1) with highest concentration recorded at Walvis Bay which both contributed about 50% to the total shellfish toxicity. This is probably due to the Dinophysis species reported in this area. Yessotoxin (YTX) was also detected in samples in trace concentrations below the regulatory limit of 1 mg/Kg with homo-YTX dominating in Swakopmund and Bird Island stations. All Lüderitz mussel samples did not show any presence of DSP toxins. A comparison is made between the recorded Alexandrium cell count and the presence of detected PSP in mussels collected in Lüderitz coast. The results showed a clear correlation between the high cell counts recorded and flesh samples containing higher concentrations of PST (Paralytic Shellfish Toxin). This phenomenon may have serious health and economic consequences, thus adequate chemical analytical methodologies are needed for monitoring purposes.

A study of the $3x + 1$ problem

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In this presentation, we are going to discuss on my research about the $3x+1$ problem also known as the Collatz conjecture. We are going to look at an introduction to the problem, a description of the problem, the existing methods that mathematicians have used in studying and attempting to solve the problem, some observations made during the research, the conclusion and some references used in my study.

Effects of mining activities on downstream heavy metal concentrations in the Omatako river basin in Namibia

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Namibia is an arid country and water sources play a vital role in all facets of its development. Agriculture and mining is of great importance to the Namibian economy, contributing 5.1% and 10% respectively to the GDP. However, these two industries also play a significant role in the pollution of water sources. The Karstveld aquifer in in the North of Namibia and water is extracted and transported along the Eastern National Water Carrier (ENWC) inland to supply major towns and cities . Water pollution by heavy metals that may arise due to mining activities

in the Karstveld, specifically in Tsumeb-Grootfontein-Otavi area was assessed and monitored for one year. Concentrations of heavy metals were measured from the origin of the ENWC to its end at the Omatako dam. As control site concentrations of heavy metals were also measured in Von Bach dam. Heavy metal concentrations were determined in both the water and sediment of the dams. Since the canal is made of cement it was measured for the water only in the canal. No significant temporal difference in concentrations was found. Concentrations were measured with both Atomic Absorption Spectrometry and Inductive Coupled Plasma- Mass Spectrometry. Omatako dam had significantly higher concentrations of copper (0.68 mg/L) and Zinc (1.0 mg/L) in the sediment compared to Von Bach dam. Significantly higher Zinc concentrations (1.4 mg/L) were found in the water at the start of the canal compared to the middle part of the canal (0.01 mg/L). Low copper and lead concentrations (<0.1 mg/L) were found throughout the canal. pH of the water was monitored throughout the sampling period and was above 7. However, in an event that the pH of the water may become acidic copper and zinc in the sediment of Omatako dam may become soluble and therefore bioavailable.

Keywords: heavy metals; mining; Namibia; pollution; River basin

***In vitro* antiplasmodial activity and cytotoxic effects of selected plants in Namibia**

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Malaria is a major global health concern, even more so in developing countries. Since current available drugs are synthesized from plants; and because these antimalarials are becoming less sensitive to the Plasmodium parasites, the development of new medicines is crucial in the fight against malaria. In addition, communities in malaria endemic countries use plant-based medicines to treat malaria and malaria associated symptoms. Hence, it is important to establish the safety and efficacy of these medicines. Two plants that are used to treat symptoms of malaria in Namibia were validated using chemical profiling and in vitro assays. Briefly, aqueous and organic extracts of *Guibourtia coleosperma* and *Diospyros chamaethamnus* were prepared using distilled water and dichloromethane-methanol (1:1v/v) respectively. Phytochemical analysis was conducted for known antimalarial classes of compounds using thin-layer chromatography. Extracts were diluted to 5, 10 and 50 µg/ml using water and DMSO and were incubated with synchronized Plasmodium falciparum 3D7A infected RBCs for 48 hours. Growth inhibition was determined using parasitaemia. The safety profiling of the extracts was determined using Fibroblast cell lines. Thin layer chromatography revealed the presence of alkaloids, anthraquinones, coumarins, glycosides and terpenoids. Antimalarial activity was observed for both plants at 5 µg/ml. *G. coleosperma* organic extract exhibited a higher percentage parasitaemia reduction (58.75 %) than the aqueous extracts (47.5 %). Whereas for D.

chamaethamnus, the aqueous extract had a higher reduction in parasitaemia (41.25 %) compared to the organic extracts (33.75 %). All plant extracts exhibited an IC₅₀ of above 100µg/ml for cytotoxicity, apart from the organic extract of *D. chamaethamnus* (IC₅₀=13.03µg/ml). These results support the ethnomedicinal use of the plants and how these herbal remedies are prepared in the traditional setting.

A further contribution to properties of remote points in point free topology

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Remote points in point free topology were introduced in, where the study restricted only to points of the Stone-Čech compactification βL of a completely regular frame L that are remote from L . In this paper we study properties of remote points of extensions of a frame L (which need not be completely regular), where, by “an extension of L ” is meant a dense onto frame homomorphism $h : M \rightarrow L$. We draw up characterizations of these remote points, showing the role played by extensions whose right adjoints preserve disjoint binary joins. We also attempt at determining conditions under which remote points in summands give rise to a remote point in a coproduct of a family of frames.

A Poisson regression model for predictors of Road Accident related Deaths in Namibia

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Almost every day the media, be it radio, television or print media reports injuries, loss of lives on our roads caused by vehicle accidents. The accidents could be due to speeding and reckless driving, disregarding traffic signals or signs driving under the influence of drugs or alcohol, distracted driving, including using a cell phone or texting while driving, driver fatigue, problems with the road or car defects.

These aspects should be investigated again for the achievement of better co-ordination among the various factors and role players involved in road safety and also for Namibia to enjoy the benefits of greatly reduced accidents in future. This paper establishes the determinants of road accident deaths in Namibia using binary logistic regression. The response variable is whether a death occurred or not as a result of the accident. Potential predictors as guided by literature and data availability in the Namibia Road Management Information System include time of accident,

region/district, weekday, junction type, roadtype, pedestrian involvement, weather condition, visibility, vehicle type, driver's age, seat belt usage, and liquor drug usage.

Anticancer and cytotoxicity properties of phytochemical compounds present in Namibian indigenous plants.

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Cancer incidences are on the rise in Namibia and prognosis is often poor at time of report. In these instances, palliative treatment is a useful option. Plants have found renowned use for treatment of cancer worldwide. Some indigenous plants found within Namibia's borders are already in use in various traditional communities to alleviate diseases and symptoms similar to those of cancer. Namibia's rich heritage of traditional medicinal plants offers an opportunity for the development of locally inexpensive treatments for the cancer burden. On the other hand, two Namibian indigenous plants; *Colophospermum mopane* and *Schinziophyton rauntaninii* have been shown to possess phytochemical compounds such as coumarins, anthraquinones, flavonoids, triterpenoids and alkaloids and these have been shown to confer certain therapeutic properties, such as anticancer. We report the anticancer effects of plants against a melanoma (UACC-62), renal (TK-10) and breast (MCF-7) cell line. The SRB method was employed based on the premise of total viable cell's protein content, whose absorbance was taken at 540 nm. The organic root extract of *C. mopane* displayed the highest anticancer activity against MCF-7 cell line with an IC₅₀ value of 30.5 µg/ml. Mild anticancer activity was demonstrated by Organic *C. mopane* root extract on UACC-62 cell line, Organic *C. mopane* bark and *S. rauntaninii* bark extracts against MCF-7. Poor cytotoxicity and no-cytotoxicity activity yielding IC₅₀ values greater than 70µg/ml were also observed. At the highest extract concentration of 100µg/ml, no anticancer activity was detected against renal cancer (TK-10). Furthermore, the cytotoxicity effect assayed against fibroblast (W138), a primary cell line was used. The assay revealed that the plant extracts were mildly cytotoxic to fibroblast, indicating proving there selective cytotoxicity towards cancerous cells. We report that the rationales of use of plants within the traditional settings are sound. Further studies are required to determine the mode of action of plant extracts.

The geochemistry of the base metals mineralisation in the Okondaurie Prospect, Opuwo, Namibia

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Geochemical prospecting for minerals includes any method of mineral exploration based on systematic measurement of the chemical properties of a naturally occurring material. The purpose of the measurements is the location of geochemical anomalies or of areas where the chemical pattern indicates the presence of ore in the vicinity. Anomalies may be formed either at depth by igneous and metamorphic processes or at the earth's surface by agents of weathering, erosion, and surficial transportation. Geochemical anomalies of deep-seated origin primary anomalies may result from apparent local variation in the original composition of the earth's crust, defining a distinctive "geochemical province" especially favorable for the occurrence of ore, impregnation of rocks by mineralizing fluids related to ore formation, and dispersion of volatile elements transported in gaseous form. Anomalies of surficial origin-secondary anomalies take the form either of residual materials from weathering of rocks and ores in place or of material dispersed from the ore deposit by gravity, moving water, or glacial ice. The Okondaurie Prospect is located within the Kaoko belt, on the Eastern Kaoko Zone; in the Kunene Region of the north-western Namibia. It is approximately 15 km from the regional town of Opuwo. Surrounded by low-lying hills, Opuwo, which means 'the end' in Herero, is a small and uninspiring town in the middle of the bush, 235 km from Khorixas and 290 km from Oshakati ,Opuwo is situated about 650 km north-northwest of Windhoek via a well mainland paved highway. Okondaurie Prospect in the Kaoko Belt is still a green field exploration area. No geological investigations have been done in the area, save the exploration Kunene resources in 2013. Speculation on the occurrence of viable mineralization is inferred from latest geochemical showings. Exploration programmes are going on to determine the economic reserves and eventually turn the prospect into a minable deposit. South of the known Dolomite Ore Formation (DOF) occurs a potential area, referred to as the Nosib-Ombombo Transition (NOT), this project then focuses on the mineralisation and the geochemistry of the DOF and NOT in the Okondaurie area.

Micro-nutrient analysis of oshikundu: a traditional fermented beverage from Namibia

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Traditional fermented beverages have been an important part of indigenous knowledge (IK) in many parts of Africa and many parts of the third world countries. They also have been an imperative part of diet in Africa for many generations. Local people understand the benefit of

food but lack the scientific understanding of food and nutrition. Oshikundu is popular in northern Namibia, and it's a popular scenario in the morning for school going children. They carry with a bottle of Oshikundu. Despite its popularity, there is no generic understanding of its nutritional status. Oshikundu is a cereal based fermented beverage, brewed from mahangu (*Pennisetum glaucum*) flour, bran, water and sorghum (*Sorghum bicolor*) malt flour. Oshikundu has a considerable amount of protein and this can be a good source of protein for malnourished children. The high moisture content which is water can be used to our advantage to supplement our diet with water. Despite its low energy content, it's a good source of vitamins such as thiamine (vitamin B1) and riboflavin (vitamin B2). Oshikundu has a potential to be introduced in the school feeding program due to its nutritional content available thus far. Further nutritional analyses (minerals and amino acids) are underway to profile Oshikundu micro-nutrient.

Chemical composition of Namibian olive oil in comparison to Spanish and Italian olive oil marketed in Namibia

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Studies on olive oil are becoming more and more numerous, due to growth in the oil production. Various chemical components have different resulting effects on the oil. Hence, determination of quality and stability of the oil becomes crucial. However, factors such as environmental conditions, ripening stage or harvest stage and method of extraction, etc. also have an effect on the oil quality. The principal objective of this research is to do qualitative and quantitative analysis of various chemical components in the Namibian olive oil, in comparison to the Spanish and Italian olive oil that is sold in Namibia. The results obtained shows that there is a high acid value in Namibian olive oil (Mixed 13 and Frontoio 13 olive oil) compared Spanish and Italian olive oil. The α -tocopherol (vitamin E) was present in all the four olive oil (Mixed 13, Frontoio 13, Spanish and Italian olive oil) samples, as shown by HPLC analysis. In conclusion, this research aim to validate the quality of the olive oil produced in Namibia. And the chemical components of study would be an effective tool to discriminate between the olive oil produced in different environments.

Trophic relationships of *Etrumeus whiteheadii*, *Mycotophids* and *Sepia* sp. off Namibia **Erasmus VN.¹, Iitembu JA.,² Julies, EM¹**

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The Namibian waters form part of the Benguela current ecosystem. This upwelling- driven ecosystem supports high abundances of pelagic and demersal fish species, which have been the backbone of Namibian commercial fishery for decades. Studies of trophic relationships of prey of these commercially important species have mainly used stomach content analyses. However, stomach content analyses results represent only recent feeding activities, and are biased because of differences in the digestion rates of different prey. Knowledge of the trophic relationships of these prey species is however crucial to understanding of the ecology of their predators and to considering multi-species interactions in fisheries management. By analyzing stable isotopes of prey muscle tissues, it was hypothesized that this study will provide new information on the trophic relationships of these prey species. Tissues from 600 fish individuals of *E. whiteheadii*, *Mycotophids* and *Sepia* sp will be analysed for stable isotopes (carbon and nitrogen). Stable isotope analysis is suitable as it gives temporally-integrated information about the diet of the predator due predictable trophic enrichment of carbon and nitrogen isotope ratio of their fish species muscle tissues.

Phytochemical, Antioxidant and Anti-nutritional properties of processed *Cleome gynandra* (Ombidi).

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Cleome gynandra (Ombidi) is a leafy vegetable that is used for medicinal properties. It is used as a source for nutrition in Africa (Kolberg H.H1997) and also to treat diseases all over the world. The diseases found to be treated by *C. gynandra* includes epilepsy, earache, headache, conjunctivitis, worm infections and many more, other properties including anti-inflammatory and anticancer (Chweya J.A et al 1997). The aim of this research is to determine the phytochemical, antioxidant and anti-nutritional properties of processed *C.gynandra*. The ethanolic extract of the dried product gave a percentage yield of 42.62 %. Major Phytochemicals such as flavonoids, tannins, alkaloids polyphenols and terpenes were identified in the processed Ombidi and confirmed using thin layer chromatography (TLC). The ethanolic extract of *C.gynandra* was also used to determine the total phenolic and total flavonoids using Folin-Ciocalteu method and aluminium chloride methods respectively. The concentration of total flavonoids was 78.25 mg/g whereas that of total phenol was 43.95mg/100g. The antioxidants were also determined, where the TLC plate showed the presence of antioxidants and DPPH radical scavenging activity and ascorbic acid as a positive control, where used to determine the content of antioxidants and absorbance of sample was read at 515 nm and the result showed 1.4 % inhibition. In conclusion processed ombidi shows that it still has good phytochemical and antioxidant activities and can

effectively be used to treat diseases due to their polyphenolic and anticancer properties of the phytochemicals. Anti-nutritional analysis is still to be done.

e-Governance

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e-Governance is being used by many governments around the world in order to improve information and service delivery to their citizens. This is being done mainly through the use of Information and Communication Technology (ICT) solutions. As a result, the capacity to implement and deliver e-Governance under the Public and Private Sectors plays a pivotal role in making e-Governance a success in the country. Through the use of qualitative and quantitative research, this study took an in-depth look at the current levels of capacity in the country. The study found that the lack of capacity is a critical barrier in many e-Government initiatives in Namibia causing them to move at a very slow and agonising pace. It is evident that the development of capacity in the country would impact positively on e-Government projects and would also reduce Namibia's dependence on foreign and expensive consultants to pilot its e-Government projects. In this vein, the study proposed ways in which capacity could be developed and also gave suggestions on how the Public and Private Sectors could collaborate with each other for the efficient delivery of e-Governance. The study looked at the Namibian Government to prioritise development of e-Government capacity to ensure that e-Governance implementation and delivery become a success.

Seasonal dynamics, abundance and diversity of microalgae in freshwater eutrophic systems of Namibia

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Microalgae are ambiguous unicellular photo or heterotrophic microorganisms present in all existing earth ecosystems. They grow rapidly and live in harsh conditions due to their unicellular and multicellular structures. When exposed to sunlight, inorganic carbon (CO₂ from the atmosphere), organic carbon (from growing substrate) and nutrients (phosphates and nitrates) microalgae produce carbohydrates, proteins and lipids (fatty acids). The lipids produced can in turn be refined to any type of hydrocarbon such as petrol or diesel.

Currently there is no research done on identifying and assessing the lipid productivity of microalgae in Namibian freshwater eutrophic systems as well as isolating and optimizing their growth rates and lipid productivity in lab scaled bioreactors. The present study will therefore fill

that knowledge gap by investigating and subsequently determining the seasonal dynamics, abundance and diversity of microalgae and in two (Goreangab dam and Swakoppoort dam) fresh water eutrophic systems in Namibia. The study will also look into manipulating the growth rates and lipid productivity of these microalgae by utilizing lab scaled bioreactors.

The research questions to be addressed are: Is there a significant seasonal difference in seasonal dynamics, abundance and diversity of microalgae in these eutrophic systems?; Is there a significant difference in seasonal lipid productivity of microalgae composite in these eutrophic systems?; Can lipid productivity and growth rates of microalgae from these eutrophic systems be increased by increasing CO₂ concentration in lab scaled reactors?; Can lipid productivity and growth rates of microalgae from these eutrophic systems be increased by the absence of light and the addition of a carbon source in lab scaled bioreactors?

Matchless Deposit

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Copper is one of the most commonly used metals in the world and contributes to the country's economy. One of the localities where copper is being mined is at the Matchless Mine, operation under Weatherly Mining Namibia. The Matchless deposit is a volcanogenic massive sulphide (VMS) Cu-Zn(Ag-Au) deposit type, which formed in a sea floor spreading environment. The tectonic evolution of the Damara orogenic cycle started at about 800-740 Ma with an early rifting stage that lead to formation of a basin, into which sediments were deposited. During rifting dominant faults existed, which were active pathways for metal-bearing hydrothermal fluids to vent onto the seafloor forming sulphide deposits. Thereafter, there was collision which lead to basin closure, compression of sedimentary units and formation of new structures. This occurred some 550Ma, producing a 350km-long and up to 3km-thick NE-trending intra-continental arm of the Late Proterozoic Damara Orogeny, within which a linear amphibolite unit is found. This linear unit is termed the Matchless Member and is said to be a remnant of the oceanic crust of the Khomas Sea that separated the Congo and Kalahari Cratons, therefore hosting most of the sulphide copper deposits. The Matchless deposit is hosted in the meta-sedimentary sequence of the Kuiseb Formation of the Damara sequence. The area has undergone three phases of deformation and metamorphism grade that reached amphibolite facies. The deformation has led to a disturbance in stratigraphy such that some units have lost their original orientation. Due to metamorphism, textural and mineralogical changes took place, making it difficult to determine the genesis of ore. Today this deposit has high degree of complexity of structures, metamorphic evolution and stratigraphy. It is rather complicated. Therefore this calls for a research project that aims at unfolding and unraveling the geological aspects of this deposit. The sulphide mineralogy of the Matchless deposit is being reviewed as well as sulphide

chemistry, paragenesis and related genetic processes. Distribution of sulphides in the Matchless Western Extension orebody is being studied, to be able to make contributions to geological aspects of the deposit and the Matchless belt at large.

Studies on the metabolic regulation of antibiotic biosynthesis in *Saccharopolyspora erythraea*

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In developing countries, the cost of medicines is a major hurdle to effective treatment of infectious diseases. In tropical countries the challenge is the numerous infections and the need for affordable antibiotics with broad spectrum activity. One way to bring down the cost of the medicines is to increase production titres and yields. To do this, understanding the physiology and metabolism of antibiotic production is critical.

In this work, *Saccharopolyspora erythraea* NRRL 2338, wild type red variant, was studied with respect to its growth kinetics and regulation of erythromycin biosynthesis. Experiments were carried out in 7 liter bioreactors on glucose substrate with bolus feed additions at designated time points. Samples were taken to determine the concentrations of biomass, erythromycin and organic acids, cellular energy metabolism and the activities of key branch point enzymes. With oxaloacetate addition, though the specific growth rate was the same (about 0.06 h⁻¹), both $Y_{x/s}$ (0.10 g/g glucose) and $Y_{p/s}$ (2.52 mg/g glucose) were lower than for the control ($Y_{x/s}$ = 0.17 g/g glucose and $Y_{p/s}$ = 2.73 mg/g glucose). However, $Y_{p/x}$ (50.35 mg/g DCW⁻¹) was more than double compared to the control culture (20.54 mg/g DCW⁻¹). In contrast, the culture fed methyl oleate produced a lower yield coefficient of $Y_{p/x}$ = 20.54 mg/g glucose). When the culture was fed methyl oleate, both biomass and the product formation consumed a larger portion of the substrate ($Y_{x/s}$ = 0.35 g/g glucose and $Y_{p/s}$ = 3.17 mg/g biomass) relative to both the control and the oxaloacetate culture. The same concentration of biomass produced double the concentration of erythromycin when the culture was fed oxaloacetate. Notably, the rate of erythromycin production was higher (0.31 mg.L⁻¹/g DCW.h⁻¹) for the oxaloacetate culture compared to 0.17 mg.L⁻¹/g DCW.h⁻¹ for methyl oleate. In addition, oxaloacetate produced 38 mg.L⁻¹ erythromycin.DCW⁻¹ compared to 32 mg.L⁻¹ erythromycin/g DCW⁻¹ for methyl oleate. It appears increased supply of precursors enables a higher rate of product formation. The conclusion is that the availability of precursor metabolites could constrain the biosynthesis of erythromycin. It can also be concluded that biomass formation competes with erythromycin biosynthesis for carbon precursors. A negative correlation was observed between the levels of ATP and the production of erythromycin. This information will enable a targeted approach to subsequent attempts to improve yield.

Authentication via Face Recognition for Automated Teller Machines

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Over the past years, people and organizations have trusted banks for their money. Banks have a huge responsibility in the safe keeping of the money, this is by making sure that the right person has access to the money and the money is available at all times.

In order for the bank to ensure that its clients have access to the money at all times, banks have introduced ATM (automated teller machines) that are placed in different remote locations.

With ATMs placed in different locations, banks also have to put up security measures to ensure that the right/intended person has access to the money. In this case the bank uses personal identification number (PIN) which is only known by the account owner.

Over the past years, PINs have not been 100% secure, this is because the PIN can be known by the wrong person who can have access to the account.

Face recognition falls under Biometrics, according to Farlex Clipat dictionary; it is defined as “biometric identification by scanning a person's face and matching it against a library of known faces”.

This project addresses the issue of implementing face recognition technology to ATM, providing better security to the people's money by offering not only PIN authentication but also face recognition. Hence the user having a peace of mind that they are the only ones accessing their money.

In order for a user to access their bank account on an ATM, they have to look at the camera, if the face is recognized as that of the owner then they can access the account.

I have been using Visual Studio C# with EMGUCV which is a cross platform .Net wrapper. It is an image processing library.

The face Recognition will implement the Principal Component Analysis (PCA) which is widely used mathematical procedure that transforms a number of correlated variables into smaller number of uncorrelated variables. It is the simplest form of the Eigen Vector Algorithm for face recognition.

The project mostly uses the Eigen Classifier which applies PCA on each image, the results of which will be an array of Eigen values that a Neural Network can be trained to recognize. PCA is a commonly used method of object recognition as its results, when used properly can be fairly accurate and resilient to noise.

Tight extensions of T0-QUASI-Metric spaces

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It is known that Dress's theory about the tight span of a metric space is equivalent to the theory of the injective hull of a metric space independently developed by Isbell some years earlier. In a paper by Kemajou et al. it was shown that Isbell's approach can be modified to work similarly for T0-quasimetric spaces and nonexpansive maps. In this talk we summarize results discussed in more details in our paper. In particular it follows from these results that large parts of the theory developed by Dress and Isbell do not use the symmetry of the metric and when appropriately modified - hold more or less unchanged for T0-quasi-metric spaces.

Establishment of woody savanna species on various mined substrates at Navachab Gold Mine

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Indigenous plant species are commonly used for mine rehabilitation. Currently knowledge gaps exist concerning the physical properties of mined substrates and the relative importance of different nutrients required for plant establishment and growth. Much research has been done on native species on mine land rehabilitation but few studies have correlated native species establishment with soil properties, and soil water properties. This study assesses the suitability of various mined and waste-rock substrates for the establishment of indigenous arid-savanna species and explores which properties make a particular substrate suitable for plant growth. The study was conducted at Navachab Gold Mine, Namibia. Seeds of seven species collected locally were germinated in the nursery and seedlings were transplanted to the field experimental site, in randomized plot design of nine mixtures of substrates. Height, number of leaves, and cumulative stem lengths of seedlings were recorded monthly and mortality was recorded in each species per substrate. For each substrate, field capacity and infiltration rate was determined and soil samples of each substrate were taken for chemical and physical properties analysis. The preliminary results show a significant difference in the average growth of seedlings between the different substrates. *Adenolobus garipensis* shows the highest average growth in all substrates and *Catophractus alexandrii* have lowest average growth in all the substrates. The survival percentage was highest in *Acacia senegal* and lowest in *Catophractus alexandrii*. It appears that certain species such as *Acacia senegal* perform better in a range of substrates compared to others

such as *Acacia erubescens*. The mixed substrate (75% waste rock: 25% kalahari sand) showed the highest percentage survival of seedlings and support most species. Marble and kalahari sand substrates have the highest seedling mortality and lowest seedling growth, supporting very few species. 62% of seedlings were still surviving in the seventh month after transplanting.

Aspects of integration

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The talk will be about the necessary and sufficient conditions for the function $f : [a,b] \rightarrow \mathbb{R}$ to be Riemann integrable and Lebesgue integrable on the compact interval $I=[a,b]$. We shall examine the role of measurability in the theory of Lebesgue integration on $[a,b]$, and investigate the relationship between the Riemann integration and Lebesgue integration on a measurable set. Beside that, we shall state the concepts and terminology's that make Lebesgue integration meaningful (more general) than Riemann integration.

The geological evolution and structures of the area west of Farm Nauzerus, northern part of the Naukluft Nappe Complex (NNC)

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The area west of Farm Nauzerus has an interesting geology that ranges in ages from Mesoproterozoic to Cambrian rocks. The lithologies are characterised by pre-Damara and post-Damara rocks, separated by a décollement thrust fault, the sole dolomite. The pre-Damara rocks, represented by the Rehoboth Basement Inlier (RBI), were deposited in rift related environments, mimicking an Andean-type arc setting. The RBI has evolved into three stages. Stage 1 involves initial rifting and deposition. It is characterised by clastic fluviatile quartzite, conglomerate, arkoses and pelitic rocks. Stage 2 involves deep and widened rifting and it is marked by major felsic igneous extrusive (ignimbrites) and plutonic activities, and strong vertical tectonics. Deposition occurred around 1.23-1.09 G.a. Stage 3 is marked by regional anorogenic outpourings of basalts deposited subaerial or in shallow water around 1.4-1.11 G.a, and it is evidenced by contemporaneous interfingering of sedimentary rocks with the basalt.

The RBI is then overlain by Neoproterozoic to Cambrian Damaran rocks, and the contact marks a regional unconformity. Deposition of these units occurred around 900-750 M.a, and are characterised by the fluviatile red-bedded braided river systems of the Kamtsas Formation. The last geologic event in the area is the emplacement of the Naukluft Nappe Complex (NNC). The NNC was emplaced onto the SFZ of the Damara Sequence, from the Khomas Highlands, due to

gravity induced tectonics as a result of continental collision. The nappes overlies the sole dolomite décollement thrust and the emplacement occurred c.a 470 M.a.

Effects of plant growth-promoting rhizobacteria (pgpr) and biocontrol bacteria from Kavango on selected cereals *Pennisetum glaucum* and *Sorghum bicolor*

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This study was conducted to isolate and screen rhizobial bacteria from grasses along the Kavango River for plant growth promoting and biological controlling abilities in order to test the hypothesis that inoculation of these bacteria may improve the growth of *Pennisetum glaucum* and/or *Sorghum bicolor*. 71 initial isolates were isolated using enrichment media, combined carbon medium and succinate medium, and screened for plant growth promotion; NH₃ production, protease activity, phosphate solubilizing, siderophore production, antifungal activity, indole-3-acetic acid production and nifH gene presence. Bacteria were identified by 16s rDNA. Results have revealed that up to 14 isolates possess at least one plant growth enhancing ability including, half of the isolates can be described as nitrogen fixers while 3 of the 14 are able to limit the growth of soil fungi. It is anticipated that inoculation of the bacteria onto seeds of *Pennisetum glaucum* and *Sorghum bicolor* could consequently lead to enhanced growth of the plants. The pot experiments are a work in progress, results will determine whether inoculation of PGPR can be successfully used as biofertilizers, biostimulants and biopesticides in order to enhance plant growth.

Estimation of groundwater vulnerability to pollution based on DRASTIC and BTU method in the upper Cuvelai-Etoshia basin, Namibia

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Groundwater is the main source of water supply in the Cuvelai-Etoshia Basin therefore understanding its quality is needed. Due to increase in population in the area, groundwater resources face two main threats: exploitation and pollution therefore it needs protection. One of the ways of protecting groundwater from pollution is by assessing groundwater vulnerability. Therefore this study was carried out to assess the vulnerability of the aquifers in the upper part of the Cuvelai-Etoshia Basin in Ohangwena region. Two aquifers were evaluated; the perched aquifers which are discontinuous aquifers located at shallow depths and the deeper seated Ohangwena 1 aquifer. According to DRASTIC index the perched aquifers are more vulnerable to contamination than the Ohangwena 1 aquifer, with depth to water table being the main hydrogeological parameter behind the variation. On the other hand, the BTU method suggests

that the perched aquifers are having high to very overall protective effectiveness due to long retention times. This finding will suggest that the perched aquifers have low sensitivity to contamination. The difference in vulnerability between the two aquifers could be a result of the fact that DRASTIC considers seven hydrogeologic parameters whereas BTU method only considers recharge, field capacity which is of course depended on the soil type and thickness of the unsaturated zone. Nitrate concentration was used for validation of the DRASTIC index. Nitrate concentration is higher in the perched aquifer than in Ohangwena I aquifer but both aquifers are polluted with values higher than 10 mg/l.

Erosion-corrosion of hard facing materials exposed to mine water conditions

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Erosion-corrosion is a major failure of mining pumps as it causes degradation of mining equipment, resulting in their leakage, thus leading to a high rate of replacement and maintenance. This paper presents the erosion-corrosion behavior of two materials in synthetic mine water. Hard facing materials are used to protect equipment against mechanical and chemical attack. A corrosion resistant Hastelloy G30 and a hard facing material, nickelchromium (Ni-Cr) alloy (both high chromium nickel-based alloys) were used to investigate the erosion-corrosion synergy using a silica-synthetic mine water slurry. The sample surfaces were subjected to an erosion test with slurry impact velocity of 30 m/s, particle size distribution of 500 µm and a jet impingement angle of 90°. The microstructures of the alloys were examined with a scanning electron microscope (SEM) with EDX, as well as optical microscopy, X-ray diffraction (XRD) and microhardness testing. The electrochemical characteristics of these alloys in synthetic mine water were studied using potentiodynamic polarisation in acidic media. The results showed that the mass loss of Hastelloy was higher than that of Ni-Cr alloy, while polarisation curves showed lower corrosion rates of Hastelloy than Ni-Cr.

An analysis of the unemployment situation in Kavango region

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Namibia's Labour market is characterized by a number of serious imbalances especially between the demand for and supply of labour and also between the skills that are required and those that are already on offer. Thus, unemployment is one of the most serious problems being faced in Namibia. This project studies the unemployment situation in Kavango region by analyzing the data from the 2011 Census and the 2012 Labour Force survey and the main aim of this study is to investigate the causes and effects of high unemployment rate in the region. A chi-square test was carried out in determining relationships between variables and a multinomial regression model was used to see if there exist an association between the dependent variable Work status and the independent variables Age, Sex, Area and Level of education. However, this study revealed that some groups suffer more incidences of unemployment than others depending on variables like age-group, sex, their level of education and whether they live in urban or rural areas thus showing a correlation. The findings of this study will however advise policy makers to come up with effective strategies that will help lower the unemployment rate both regionally and nationally at the benefit of the society and the country's economy.

The role of science and research in validating Namibian traditional medicinal plants for their anti-HIV/AIDS and toxicity properties

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The first case of Acquired Immunodeficiency Syndrome (AIDS) in Namibia was identified in 1986. In 1992, Human Immunodeficiency Syndrome (HIV) prevalence was 4.2% which rose to 15.4% in 1996 and peaked in 2002 at 22.0% before declining to 19.7% in 2004, and 17.8% in 2008. 13.1% in 2011. Presently, about 230,000 to 250,000 people are living with HIV/AIDS. HIV prevalence among Namibians aged 15-49 years is estimated at 12.4 - 18.1% in 2012 and annual death rate of about 7,100 attributable to AIDS. Namibia has a rich plant biodiversity and a long tradition of medicinal use of plants. This rich plant biodiversity provides an important resource that may contain novel anti-HIV compounds. Thus, it is important to search for novel antiretroviral agents that can be added to or replace the current arsenal of drugs against HIV from Namibian medicinal plants. A study is currently being undertaken by UNAM to validate effects of medicinal plant on HIV by targeting various enzymes used in the synthesis of the virus. Various plants parts (Roots, Leaves, Stems, Dead bark and live bark) used by traditional healers were collected. A total of 23 plants (87 plant parts) were extracted with various solvents: Aqueous (water), Ethanol and DCM: MeOH (1:1; v/v), representing 220 extracts. Hits were observed with 40 extracts from 36 plant samples representing 15 plants. Cytotoxicity tests (using cell lines) were also carried out on all samples. The current results are promissory and the next stage of Bio-assay guided fractionation, Isolation and identification of active compounds is

underway and will help retain indigenous knowledge and exploit the commercial potential of these medicinal plants.

Cytotoxicity analysis and inhibitory activities of ethno-medicinal plants on HIV-1-Reverse transcriptase

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The emergencies of drug resistant viral strains have made reliance on anti-retroviral therapy (ART) unsustainable. Given the shortcomings of the current regimens of ART, there is an increasing interest in the use of ethno-medicinal plants for the management of HIV/AIDS. Namibian ethno-medicinal plants have not yet been validated for their efficacy in interfering with HIV cycle and their toxicological effects to mammal cells has not yet been reported. Hence the aims of this study were two-fold: (1) to validate selected Namibian plants for their biological activities against reverse transcriptase (RT) enzyme necessary in HIV-1 cycle and (2) to evaluate their toxicity to cells. A total of 23 plant species were analyzed for their anti-RT and cytotoxicity activities. Samples were coded due to their potential commercial and intellectual property (IP) values. The assays were carried out using high through-put screening colorimetric assay using 10-fold serial dilutions for each sample in 96-well plates. Absorbance for RT inhibition assay was read at 405 nm and that of cytotoxicity at 492 nm using Tecan Infinite F500 plate reader. Non-linear regression sigmoidal curves were used to determine the IC₅₀ and LC₅₀ for each sample. The study found that 36 plant parts from 15 plants have a concentration-dependent inhibitory activity against RT. The lowest LC₅₀ values were: 0.00088 mg/ml (2-625); 0.0011 (2-628); 0.0029 mg/ml (2-626); 0.0035 mg/ml (2-627); 0.0048 mg/ml (2-629); 0.0249 mg/ml (3-953); 0.0344 mg/ml (3-896); 0.0536 mg/ml (3-961); 0.0538 mg/ml (3-935); and 0.1367 mg/ml (2-640). Several plant extracts have high IC₅₀ values which are indicative of their low toxicity to cells: 88.77 mg/ml (3-972); 79.74 mg/ml (3-918); 63.73 mg/ml (3-954); 63.11 mg/ml (3-953); 33.86 mg/ml (3-961); 29.14 mg/ml (3-936); 20.16 mg/ml (3-956); 18.78 mg/ml (3-905); 12.02 mg/ml (3-989); and 9.949 mg/ml (3-992). Thus, bio-assay guided fractionation, isolation and identification of active compounds of the active plant parts need to be carried out in order to patent and commercialize these natural products.

Computational Studies of Thermochemical and Kinetics of Primary Ozonides of Anthracene

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Ozone is a very reactive, toxic gas. It occurs naturally in the Earth's upper atmosphere and in the air of the lower atmosphere after a lightning storm. It is also produced when air pollutants from automobile emissions and manufacturing operations interact with sunlight. Ozone is very useful in the sense that it makes life on planet earth possible to every organism. The triatomic oxygen form is known to react readily with alkenes. When compounds containing double bonds are treated with ozone, usually at low temperatures, they are converted to compounds called ozonides. The reaction is via the cleavage of the π bond. Primary ozonides are the first intermediates in the reaction of ozone with several compounds with multiples bonds, and many of these compounds are found in the atmosphere and drinking water. Primary ozonides are transient or short lived compounds. For this reason, they are very difficult to isolate and their properties not easily determined. The primary ozonides investigated in this study are those of Anthracene, a polyaromatics hydrocarbon. The primary objective of this work is to determine thermodynamic properties and study the kinetics of various primary ozonides of Anthracene.

An investigation on the living standards of recent migrants in Havana informal settlement in Windhoek

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The study suggests an investigation on the living standards of the recent migrants in the Havana informal Settlement in Windhoek. Most people come to cities/town from rural areas in search for jobs. However new migrants face situations like low income and unemployment which pushes them to reside in informal settlements. In the informal settlements they face problems such as poor water supply, no electricity, poor service delivery, poverty and overcrowding. The objectives of the study are to examine the socio-economic characteristics, to examine whether there is an association between income and health access and to make a policy recommendation. A questionnaire was used as a guide to interviews for data collection and a systematic sampling method was used whereby the target pop. was 400 households. Descriptive statistics and Binary logistic regression is going to be used for data analysis. The results shows a positive association between income and health access.

KEY WORDS: Standards of living, Migration, Poverty, Urbanization and Unemployment

Synthesis, characterization, and biological activity testing of some metal complexes containing pyridine thio-based ligands

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Nitrogen-sulphur containing organic compounds and their metal complexes are currently being extensively studied. This is because they have been found to possess interesting physico-chemical and potentially useful pharmacological properties. It has also been found that the introduction of metal ions into the organic compound greatly affect the biological activity of the parent organic compound. This means that, the biological activity of the organic compound is either enhanced or lowered in the complex and this depends on the type of the organic compound and also the type of the metal ion used.

This study focuses on the synthesizing of metal complexes of two ligand systems derived from pyridine thio-based ligands. Here, the ligands will be synthesized by the reaction between a suitable ketone and sulphur containing hydrazine. The metal complexes will be synthesized by reacting appropriate metal salts of selected transition metals with suitable ligands in suitable solvent systems. Spectroscopic measurements will then be done using conventional techniques such as elemental analysis, ¹HNMR, mass spectroscopy and, infra-red spectroscopy to characterize the synthesized compounds before sending them for biological tests for activities against the malaria parasite *P. falciparum*.

Determination of the metals present in mining samples using ICP-OES.

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The aim of the study is to quantitatively determine the metals present in various mine samples using inductively coupled plasma-optical emission spectroscopy (ICP-OES). Various sample preparation procedures were evaluated, some of which included the use of microwave assisted acid digestion. This technique offers short digestion time, less acid consumption and high extraction efficiency. Once the best method was determined, it was validated and applied to the analysis of mining samples. The method was validated by experimentally determining its reproducibility (inter-assay precision), linearity, limits of quantitation and limits of detection.

Application of the QuEChERS method to the quantitative determination of pesticide residues in Namibian wine by gas chromatography (GC)

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Chemical analysis of wine is essential in ensuring product safety and conformity to regulatory laws governing the international market, as well as understanding the fundamental aspects of grape and wine production to improve manufacturing processes. A modified quick, easy, cheap, efficient, rugged and safe method (QuEChERS) coupled to gas chromatography (GC) was developed for rapid extraction and simultaneous determination of a number of pesticides in wines. The extraction solvent used for the QuEChERS procedure was acetonitrile and the purifying agent was primary secondary amine sorbent. This was followed by a liquid-liquid extraction step, using hexane as extraction solvent. The hexane was subsequently evaporated in order to concentrate the extract. The method was validated in terms of its accuracy (recovery) precision (reproducibility), linearity, limits of detection (LODs) and limits of quantification (LOQs).

Utilization of information resources by the Faculty of Science students and academic researchers at the University of Namibia: a snapshot study

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Information resources refers to any information in electronic, audio-visual or physical form, or any hardware or software that makes the storage and use of information possible in order to support learning, teaching and research at the university, and which in turn will become part of a lifelong learning process. The study investigated the usage of information resources by Faculty of Science students and academic researchers by identifying their information needs, for example by examining the types of information sources used, looking at awareness of different information resources, and preferred information formats. The study examined the information searching process, and reasons for choosing specific sources over others. The study also looks at challenges encountered in the course of the information searching process. A mixed method of quantitative and qualitative approach was used, employing structured questionnaires for data collection, which was distributed using purposive sampling to 72 students and seven (7) academic researchers, one from each department of the Faculty of Science. The study puts forward the hypothesis that, science students and academic researchers lack the knowledge, awareness and information searching skills required to access available information resources to support learning, teaching and research at the University.

Radiocarbon age dating groundwater of the Ohangwena II Aquifer in the Ohangwena region

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The recently discovered Ohangwena II aquifer is part of the Cuvelai Etosha Basin, which too belongs to a much larger Kalahari Basin. The Ohangwena II aquifer is located in the Main Deep Aquifer system and thus it is a confined porous aquifer, dominated mostly by fluvial sediments with some reworking of aeolian sand. This aquifer is a source of fresh water in this region and is estimated to probably supply water to the Northern part of Namibia for the next 400 years if managed properly.

Carbon-14 a radioactive isotope of carbon is produced in the transition zone between the troposphere and stratosphere, it is assimilated by groundwater as carbon dioxide molecules and has a half life of 5730 years making it appropriate for dating ground water in an age range up to 40 000 years. Measurements of dissolved inorganic carbon in groundwater can thus be used to provide ground water ages.

Estimation of ground water residence times aids in the integral water management schemes, which will enable sufficient water supply for people living in the North central part of Namibia.

An investigation on the effects of the mother's housing conditions to the infant's weight at birth

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Recent studies have shown that there is a significant relationship between infant mortality and low birth weight, implying that infants that are born with low birth weight (2,500 grams) have a likelihood of surviving. Researchers looked at maternal health, HIV/AIDS and pregnant women and immunization in reduction of infant mortality but a blind eye is turned on the housing conditions (as a socio-economic factor) in the woman lived while pregnant. The findings of this study will advise policy makers on the best practices to improve the housing conditions of residents especially expecting mothers and also stimulate additional research into areas which may contribute to low birth weight and other factors that contribute to poor or bad housing conditions. This study aimed to assess the relationship between housing conditions in which the woman lived when she was pregnant and the birth weight of the child using the Namibian Demographic and Health Survey (NDHS) 2006-2007. The study also aims to find the probability of low birth weight using the logistic regression analysis. The results show a correlation between wall material, floor material, toilet facilities and birth weight.

Sediment hosted Cu-deposits in the central Damara belt

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Sediment-hosted Copper- sulfide deposits in the Southern Central Zone occur in stratigraphic units of the Neoproterozoic Damara Group. The period around 1000-540 Ma tend to represent a transition in the nature of crustal evolution, involving changes in the volume and composition of the continents tectonic regimes. This was the period of stability and the existence of major land masses. The Khainkagchas deposit appears to be on North-Eastern Synclinal limb, hosting Copper sulfide mainly in the form of malachite ($\text{Cu}_2\text{CO}_3(\text{OH})_2$) concentrated in Calc-Silicate and marbles in the Rossing Formation of the Swakop Group in the Damara orogenic belt.

This sediment-hosted base metal deposits are genetically linked to the circulation of connate fluids during diagenesis, mainly enriched in (Cu-Pb-Zn-Ag). The area is highly dominated by sheeted leucogranites (alaskites) bodies. The leucogranites have a simple mineralogy, containing Quartz, plagioclase and K-feldspar. This sheeted leucogranites primarily hosts uranium mineralization and intruded the metasediments. Large scale structures like folds, faults and boudins can be recognised in the area. The rocks are mainly striking NE-SW and dipping to the SE.

Influence of transition metals on the mechanical properties of boron suboxide (B_6O) materials

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The development of synthetic superhard materials which have hardness values approaching or even exceeding that of diamond has been of great interest to material scientists. With Vickers hardness of between 70 to 100 GPa, diamond is the hardest material known. However, diamond application is somewhat limited at high temperatures owing to its instability, for example, as cutting tool for steel. Furthermore, as the temperature increase, diamond weakens due to the onset of the transformation to the graphite structure as well as due to diffusion wear. Boron suboxide has a better thermal stability compared to diamond and the starting materials (boron and boron oxide) are cheap. For these reasons and because of the need to replace expensive diamond in many other applications, boron suboxide has been of technological interest. Although, B_6O has good hardness values, the problem of low fracture toughness and the difficulties to densify has delayed the application of B_6O materials as superhard materials in the industry. Therefore, in this work, effort has been directed towards improving the fracture

toughness and densification of these materials by incorporating suitable secondary phases and tailoring the microstructure to the desired properties.

Boron suboxide (B₆O) powder was synthesized from the reaction of amorphous boron and boric acid powders. The synthesized B₆O powder was hot pressed at 1900oC and 50MPa. In addition to the pure B₆O material, composites with transition metals, transition metal oxides, and transition metal borides were prepared at 1850oC. The microstructure, phase composition and properties of resulting materials were investigated. A boride secondary phase was formed after sintering. Materials with densities higher than 95% theoretical density were achieved for the composites. Although the pure B₆O sample was brittle, fracture toughness of 7.6 MPam^{0.5} was obtained for the B₆O+FeB material.

ENDOCRINE DISRUPTING POTENTIAL OF VARIOUS WASTEWATER TREATMENT PLANTS AND THE GOREANGAB WATER RECLAMATION PLANT IN NAMIBIA

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In Namibia urbanization creates a greater demand for water in Windhoek, Walvisbay and Swakopmund. Endocrine Disrupting Chemicals (EDCs) are pollutants that are present in treated or untreated municipal waste waters and affect the endocrine system, biochemical messengers, and cellular receptors. This study investigated the concentrations of estrone, estradiol and testosterone in the Gammams (GSTP), Swakopmund and Walvisbay Sewage Treatment Plants (STPs) and the Goreangab Water Reclamation Plant (GWRP). Samples from Swakopmund and Walvisbay STPs were taken once-off, while a seasonal study was conducted for GSTP and GWRP. Seven bioassays were used to establish selected steroid hormone levels, immunotoxicity, cytotoxicity and neurotoxicity of water samples. Estrone removal efficiency was 22 %, 39% and 90% in Walvisbay, Swakopmund and Gammams STPs, respectively. Estradiol removal efficiency was 41%, 25% and 83-98% in Walvisbay, Swakopmund and Gammams STPs, respectively. Concentrations of estrone and estradiol in GWRP outlet were below detection limit. Testosterone removal efficiency was 69% and 12% in Walvisbay and Swakopmund STPs, respectively, while no testosterone was detected in GSTP and GWRP outlets. Gammams STP achieved successful removal of neurotoxicity and cytotoxicity throughout the year. Any EDCs in the intake of GWRP is completely removed by tertiary treatment in the reclamation plant.

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Mushroom Research and Development in Namibia

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Mushroom research and development was an initiative of ZERI Africa Regional Project under UNDP when it introduced mushroom farming in Namibia in the late 90s. The focusing is mostly on community empowerment through transfer of technologies for growing mushrooms. The process first developed and published advocacy written in reader-friendly language, and appropriately illustrated with photographs with the aim of promoting and increasing public awareness on the benefit of mushrooms as food, medicine and as an income generation activity. However in Namibia, the utilization of wild mushrooms as food is very common, wild edible fungi provide two main benefits to people, as source of food and income. It is very common to see people, particularly young women selling mushrooms by the roadside during the rainy season. *Termitomyces schimperi*, *Terfezia pfeilii* (Kalahari Desert truffles) are some of the most hunted and sold wild mushrooms in rural areas of the country. The project started by exploring the utilization of various locally available organic materials, especially that of agriculture after harvesting, for use as substrates for oyster mushroom production. The testing of pasteurization techniques of different substrates followed, as well as the evaluation of different designs of mushroom houses constructed using different available local materials. Oyster mushroom cultivation under different climatic conditions was done in most regions of the country. Researchers have identified some of the indigenous mushroom species for domestication, and indigenous *Ganoderma* mushrooms are being cultivated successfully since 2010. Medicinal uses for some indigenous mushrooms have been determined. Genetic diversity for the endemic *Ganoderma* species from four Regions in the country has been determined as well as its medicinal uses by the indigenous people. Some of the researches done include: Absorption of iodine from substrate (Grass and maize cobs) by oyster mushrooms the *Pleurotus* species, Types of mushrooms used for medicinal purposes in Oshana and Ohangwena Regions of northern Namibia, Determination of optimum ratio of seaweed (*Laminaria pallida*) in a mixture of veld grass and spent barley grain for the production of oyster mushrooms *Pleurotus ostreatus*,

Molecular identification of indigenous mushrooms, The possibility of growing oyster mushrooms on corn cobs and sunflowers stalk and many more. Mushroom research and development have advanced in Namibia with more communities having been trained in mushroom cultivation and its post-harvest. Researchers are now focusing on mushroom product development with an outstanding product of 100% *Ganoderma* dietary supplements produced by the ZERI Project during August 2013. ZERI plans to develop more products from indigenous mushrooms in the form of tea, soups and chips in order to contribute to food security in the country.

Synthesis, characterization and application of cation sensors using different chemosensors
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Chemosensor is a receptor that interacts with analyte producing a detectable change in a signal, more importantly naked eye detectable colorimetric activities. Chemical sensors are used for detection and quantification of chemical species, generally the anions, cations and neutral species. They have been found to possess a wide range of application in clinical, industrial, environmental, agricultural and military technologies. Chemical sensors are characterized by parameters such as sensitivity, selectivity, response, recovery time and saturation. Different sensors are mostly synthesized through a classical Schiff base reaction. This work focuses mainly on the synthesis, characterization and applications of cation sensors. These compounds will be characterized by elemental analysis, infra-red and uv-visible spectrometer. The synthesized compound will be tested for recognition of alkaline, alkaline-earth and transition metals. The nature of substituent at different compounds will allow the fine tuning of the signal mode as spectrophotometric titration.

A million dollar worth math problem: Riemann Hypothesis

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The Dirichlet Series $\sum_{n=1}^{\infty} \frac{1}{n^s}$ is convergent for all real $s > 1$ and divergent for all $s \leq 1$. Whence the series converges to a value, it is denoted by $\zeta(s)$, zeta function. When s is a complex number, then the series is convergent for $\text{Re}(s) > 1$. Bernhard Riemann goes further than Euler, and gives a formula for the zeta function which is analytic in the entire complex plane except at $s=1$. Hence the zeta function is analytically continued to the complex plane in particular the complex half

plane. In his 1859 paper, “On the number of primes less than a given quantity”, he claims that the non-trivial zeros of the zeta function lies on the critical line $\text{Re}(s)=1/2$, which is the famous Riemann Hypothesis and since then it has remained unsettled.

Cumulative risk of adult and old-age mortality in Namibia: are there any socio-economic disparities?

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Adult mortality remains a neglected public health issue in sub-Saharan Africa, with most policy instruments concentrated on child and maternal health. Lack of data have also compounded the situation. Interest to better understand the epidemiology of HIV, which has a greater impact on adults, has rejuvenated research in adult mortality. Moreover, following the PEPFAR initiatives, recent DHS have collected data that can be used to assess the impact of these programmes on adult survival. This presentation explore how socio-economic position exacerbates risk of adult mortality. Understanding the risk factors of adult mortality is crucial towards designing programmes and interventions aiming at improving the well-being of adults. The study uses Kaplan-Meier curves and log-rank test in examining the issues around socio economic risk factors on adult mortality assuming the time (age) at which the event (death) occurred is measured in discrete units (years) i.e. age at which the person died in completed years. The analysis used adult mortality data of 28854 individuals aged between from 15years and above from the 2006/07 Namibia Demographic and Health Survey. Exploratory analysis show a clear disadvantage for those in rural areas, for those of low wealth ranking and those not married. Further, seeking health care from hospital, as well as receiving care within hours, or using a car provided an advantage of better survival at old age. Deliberate policies that support socially-disadvantaged should be put in place in Namibia to reverse these disparities.

KEYWORDS: adult mortality, discrete-time event history analysis, KaplanMeier, Namibia, soci-economic position

A metamorphic study on the variation of grade and isograds in the Khan-Swakop river confluence area.

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P-T paths obtained from metamorphic rocks are one of the primary lines of evidence used by geologists to develop models of orogenic dynamics. Investigating and understanding the metamorphic evolution is crucial for the understanding of earth's history and temporal evolution of plate tectonic processes as metamorphic rocks provide the primary record of the thermal structure of the earth over geologic time. This thesis describes and interprets deformational and metamorphic processes and their temporal relationships through absolute time using the Khan and Swakop river metamorphics located in the core of the Damara belt in the CZ. The CZ is a classic high-T low-P metamorphic terrain. Peak metamorphism increases from NE to SW along the central zone changing from amphibolite facies conditions around Karibib to lower-granulite facies towards Swakopmund where peak metamorphic conditions were reached. Khan River and Swakop River exposes a unique structural section into the root of the Pan-African Damara orogenic belt in Namibia. Several poly metamorphism has been recorded to have occurred in the area. There is a need to find a way to extract useful information about the P-T evolution by using a mechanism that see through overprinting events to unravel the thermal history of tectonism. In attempt to correlate P-T paths to tectonic processes and orogeny mineral paragenesis technique have been used to extract P-T information. paragenesis is a simple technique that determines P-T based on analyzing equilibrium assemblage of mineral phase.

Inhibition of HIV-1 enzymes, antioxidant and anti-inflammatory activities of *Plectranthus barbatus*

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Ethnopharmacological relevance: *Plectranthus barbatus* is widely used in African countries as an herbal remedy to manage HIV/AIDS and related conditions.

Aim of the study: To investigate the HIV-1 inhibitory, anti-inflammatory and antioxidant properties of *P. barbatus* and thereby provide empirical evidence for the apparent anecdotal success of the extracts.

Methodology: Ethanolic extract of *P. barbatus*'s leaves was screened against two HIV-1 enzymes; protease (PR) and reverse transcriptase (RT). Cytotoxicity of the extract was determined through measuring tetrazolium dye uptake of peripheral blood mononuclear cells (PBMCs) and the TZM-bl cell line. Confirmatory assays for cytotoxicity were performed using flow cytometry and real-time cell electronic sensing (RT-CES). The free radical scavenging activity of the extract was investigated with 2,2-diphenyl-1-picrylhydrazyl while the anti-

inflammatory properties of the plant extract were investigated using a Th1/Th2/Th17 cytometric bead array technique.

Results: *P. barbatus* extract inhibited HIV-1 PR and the 50% inhibitory concentration (IC₅₀) was 62.0 µg/ml. The extract demonstrated poor inhibition of HIV-1 RT. Cytotoxicity testing presented CC₅₀ values of 83.7 and 50.4 µg/ml in PBMCs and TZM-bl respectively. In addition, the extract stimulated proliferation in HIV negative and positive PBMCs treated. RT-CES also registered substantial TZM-bl proliferation after extract treatment. The extract exhibited strong antioxidant activity with an IC₅₀ of 16 µg/ml and reduced the production of pro-inflammatory cytokines indicating anti-inflammatory potential.

Conclusion: This is the first demonstration of the in vitro anti HIV-1 potential of *P. barbatus* including direct activity as well as through the stimulation of protective immune and inflammation responses. The low cytotoxicity of the extract is also in agreement with the vast anecdotal use of this plant in treating various ailments with no reported side-effects.

The use of curcumin from tumeric as a template in the synthesis of potential anticancer agents

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Tumeric (*Curcuma longa*) is an herb that belongs to the 'ginger family' whose most valuable part is the rhizomes from which the active compound, curcumin, is obtained. Curcumin is the main colouring substance in foods and textiles but is also used to treat biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism, and sinusitis. Despite its poor bioavailability, curcumin has potential for use in the pharmaceutical industry as evidenced by the wide range of biological activities displayed by its analogues. These include anti-inflammatory, antiviral, antioxidant and, more importantly, antitumour activity. The objective of this study is therefore to isolate curcumin and to synthesize and characterize dimeric analogues modelled on it.

The isolation of curcumin from tumeric was successfully accomplished by solvent extraction using ethanol as a solvent and gave a yield of 8-10%. The curcumin extract was subjected to thin layer chromatography (TLC) which allowed for determination of chloroform: methanol as a suitable mobile phase for the separation of curcumoids via column chromatography. Spectral analysis to confirm the structure of curcumin is currently underway and will be followed by the synthesis of the dimers which will be submitted for anticancer activity testing.

An analysis on the barriers associated with inconsistent use of contraceptive services among adolescents in Namibia

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Recent studies have shown that inconsistent use of contraceptive services among adolescents is mostly due to the background of a person, poor and uneducated people are less likely to make use of contraceptive services. Researchers have found that inconsistent use of contraceptive results in unwanted pregnancy, baby dumping, school drop-out, maternal deaths. Evidence suggest that adolescent girls who give birth each year have a much higher risk of dying from maternal causes compared to women in their 20s and 30s. Findings from this study will help in policy making that will enhance maximum use of contraceptive services, reduce unwanted pregnancy and also delay marriages. The study aims to establish barriers associated with inconsistent use of contraceptive services, other objectives include establishing factors that determine contraceptive use and establish adolescent fertility. Namibian Demographic and Health Survey (NDHS) 2006-2007 was used and target population was the sexually active female adolescent. Chi-square and logistic regression analysis was used to find the probability that a factor could be a barrier associated with inconsistent use of contraceptive services. Results show that level of education, wealth, knowledge, marital status frequency of listening to radio and watching television were found to be barriers associated with inconsistent use of contraceptive services among female adolescents in Namibia. Most adolescents had given birth to a total number of 2-3 children.

Applications of metals in medicine

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The paper will give a brief historical development of the use of metals in medicine. It will then focus on the current applications of metals in medicine with illustrations from selected examples. An attempt will be made to link this with the bioactive metal complexes so far synthesized by our research group.

Computational studies of Thermochemical properties and Kinetics analysis of Silabenzene Primary Ozonides.

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Ozonolysis involves the cleavage of an alkene or alkyne with ozone to form organic compounds in which the multiple carbon–carbon bond has been replaced by bonds to oxygen. When compounds containing double bonds are treated with ozone, usually at low temperatures, they are converted to compounds called Ozonides. The outcome of the reaction depends on the type of multiple bonds being oxidized and the workup conditions. Silabenzene is an unstable and very reactive heteroaromatic compound containing one silicon atom instead of carbon atom in benzene. The reaction of Silabenzene and Ozone produces unstable primary Ozonides that rearrange to form stable secondary or tertiary Ozonides. The thermochemical and kinetic properties of silabenzene Ozonides and Thiozonides are investigated in this study using Density Functional Theory and the B3LYP/6-311+G* basis set.

A university Chatterbot system

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In order to introduce the topic for my research proposal it is necessary to go through some basic history and theories of computing:

1. Moore's law is a prediction based on an observation of computing hardware that states that the number of transistors on integrated circuits doubles approximately every two years.
2. AI is defined as the science of making computers do things that require intelligence when done by humans.

The study of how to make computers do things at which people are doing better.-IEEE Neural Networks Council (1996).

3. Alan Turing (1912-1954) was an English mathematician and cryptanalyst during the second world war and he wrote a paper which in both those days and this day and age is referred to as a Landmark paper in which he posed the question :Can machines think?

Following this he devised the Turing test in which an interrogator must determine which respondent is the computer and which is the human.

If the interrogator cannot tell the computer apart from the human, the computer is judged to be intelligent and the program used to communicate was referred to as a chatterbot.

Turing predicted that it would be possible for a computer with 10^9 bits of storage space to pass a 5 minute version of the test with 70% probability by the year 2000, it is the year 2013 and with respect to Moore's Law and Turing's prediction we should have been able to achieve that goal 13 years .The Loebner prize is an annual competition designed for this purpose and the 2 one time prizes have never been claimed

This is the motivation for my project, which is aimed at creating a platform for university students to work on a combined chatterbot that will hopefully one day be able to partake in these contests.

\$25,000 is offered for the first chatterbot that judges cannot distinguish from a real human and which can convince judges that the human is the computer program. \$100,000 is the reward for the first chatterbot that judges cannot distinguish from a real human in a Turing test that includes deciphering and understanding text, visual, and auditory input. Once this is achieved, the annual competition will end.

My System will be aimed at the construction of an initial chatterbot and a system where users can log in and submit code as well as their modified version of the chatterbot or an original version in order to promote the development of a stronger unified program, by allowing multiple user access. I hope to allow rapid development through the sharing of ideas, tweaking and the identification of bugs and glitches through a sort of Open Source approach that would still maintain exclusivity.

The importance of monitoring systems for translocated wildlife species in communal conservancies: a case of the Nyae Nyae conservancy

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The CBNRM programme in Namibia aims at providing opportunities for rural communities to improve their livelihoods by utilizing wildlife for tourism and other wildlife related activities through establishment of conservancies. In order to achieve this objective for both biodiversity conservation and socio-economic development, it was essential to restock or build up wildlife populations in conservancies through translocation. Translocation is defined as a deliberate, human-induced movement of living organisms from one area to another (IUCN, 1998). This study is looking at the monitoring systems put in place for translocated wildlife species in the Nyae Nyae conservancy during 1990 – 2005. A total of 2200 ungulate individuals from 8 species were translocated into the conservancy. The study revealed that conservancy depends on collaborative and community-based monitoring systems for wildlife. This implies that the monitoring processes involved different stakeholders and consisted of more than one monitoring type with a strong involvement of the local community. The Event-book system is a community-based natural resources monitoring system carried out daily at local level by community game rangers. This monitoring involves veld monitoring, patrols and recording of stochastic events such as fire, poaching, problem animals, mortalities. The other monitoring type is the annual game counts using the 48 hour water point count. This is done by the conservancy members collaboratively with experts from government and NGOs. In addition, government and other relevant stakeholders complement the local level monitoring efforts with aerial surveys and

collaring of translocated species. However, the community-based monitoring in this conservancy is challenged by the vastness of the area, the area being an open system and a number of management shortfalls. The community-based monitoring systems provide consistent data on the general trend of wildlife species within the areas with little direct focus on translocated species.

Analysis on the factors influencing student's academic performance in analytic geometry at the University of Namibia

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This study is designed to identify and analyze some determinants of academic performance (measured by final mark) in a course known as Analytic Geometry, Matrices, Vectors and Complex Numbers offered by the Faculty of Science and the Mathematics Department, which is associated with repeated and chronic high failure rates. This study specifically aims at establishing the relationship between the symbol obtained in mathematics at grade 12; the age and gender of the student; the mode of study and the accommodation of the student and their academic performance. The target population for this study is all the students that did the above mentioned course in the past 5 years (2008 to 2012) which is approximately 1 746 students. SPSS and Microsoft Excel were used to carry out all the analysis. Data was obtained from the University Statistician Mr. Reino Ihemba and it was analyzed using descriptive statistics, Analysis of Variance procedures (ANOVA), regression models and graphs. The results from the tests performed showed the symbol obtained in mathematics from secondary school, the age, the study mode and the accommodation of the student has a significant influence on the performance of the student except the gender of the student. Student's with higher symbols in mathematics from grade 12; younger students; full time students and hostel students perform better in this course.

High resolution chromatography: The key to contemporary natural product analysis

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In 1903, M. S. Tswett invented chromatography for the purpose of separating plant pigments. Today, 110 years later, chromatography is still the most powerful tool used for the separation and analysis of natural products. Traditionally, natural product chemistry involved the use of preparative chromatographic techniques, such as column chromatography and preparative planar chromatography, for the isolation and purification of natural products. These techniques are laborious and time-consuming and normally require an additional purification step like

recrystallization in order to yield pure substances for further structure elucidation and bioactivity testing. High resolution chromatography techniques including gas chromatography, high performance liquid chromatography, ultra high performance liquid chromatography and multidimensional chromatographic techniques have revolutionized natural product analysis by significantly speeding up the isolation and identification (with or without prior isolation) of unknown compounds occurring in nature. However, the disadvantage of these techniques, compared to the traditional methods is that they normally only offer the isolation of small quantities of the compounds of interest. Luckily, due to recent advances in the hyphenation of chromatographic techniques to specialized identification and bioactivity determination techniques, this problem is being addressed. In addition, such hyphenated techniques can also be applied to the analysis of natural products that is only found in small quantities in nature, such as the pheromones of small insects. In this review the latest developments in high resolution chromatography, some of its hyphenated techniques and their application to the analysis of natural products are discussed.

An Investigation of the Number π

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It is known that almost every real number is transcendental which implies that algebraic numbers are countable. It was J. Liouville in 1844 and G. Cantor in 1874 who gave outlined proofs that transcendental numbers exist, without necessarily just providing an example of one. There is no general criterion, other than their definition to determine whether a given number is transcendental or not. This project aims at studying transcendental numbers with a special focus on π . Carefully studying its properties; that of being an irrational and transcendental number, and use the proofs as templates to investigate the irrationality and transcendence of $\pi + e$ and πe numbers that to date, we do not know whether they are transcendental or not.

Comparison of species diversity, prevalence and intensity of infestation of fleas (Siphonaptera) of small mammals from different geographic localities in Namibia

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Small mammals host a wide variety of communities of ectoparasites. There are many factors that influence the abundance and diversity of ectoparasites on small mammal hosts. These include season, size of hosts, the sex and age of hosts and differences in the immunity levels of the hosts. Studies have also revealed that variation in geographic regions may influence the abundance and

diversity of ectoparasites. The objectives of the present study were to determine and compare the species diversity, prevalence and intensity of infestation of fleas of small mammals at three different localities found in three different biomes in Namibia.

Sherman live traps baited with peanut butter and oats were used to trap small mammals in Mariental (nama karoo biome), Okahanja (savannah biome) and Katima Mulilo (woodland biome) in 2012 and 2013. Fleas collected were processed using the serial alcohol and xylene mounting procedure and mounted on Canada balsam to permanently preserve these specimens. Small mammal hosts and fleas were identified to species level. A total of three hundred and thirty six (336) small mammals belonging to seven species (*Aethomys chrysophilus*, *Elephantulus intufi*, *Gerbilliscus leucogaster*, *Mastomys* sp., *Micaelamys namaquensis*, *Rhabdomys pumilio*, and *Saccastomus campestris*) were captured from the three study sites. A total of two hundred and sixty two (262) fleas belonging to 10 species, (*X. brasiliensis*, *X. choepis*, *X. hirsuta*, *X. hipponax*, *X. nubica*, *X. philoxera*, *X. pirieri*, *X. scopulifer*, *X. torta* and *X. versuta*) were collected from the infested small mammal species. For hosts captured in Mariental, the overall prevalence of fleas on hosts varied among the three sites with no fleas found on *E. intufi* and 42.7% in *G. leucogaster*. Overall prevalence of fleas on small mammals in Okahanja was highest (39.3%) in *M. namaquensis* and lowest (0.9%) in *E. intufii* and *S. campestris*. In Katima Mulilo the overall prevalence was highest in *G. leucogaster* (33.8%) and lowest in *S. campestris* (1.5%). The species diversity and intensity of infestation among the three study sites will be discussed.

***Hydnora* – The ingenious genus**
(Advances in our understanding of these peculiar plants)

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Hydnora is a genus of root holoparasites with its centre of diversity in Namibia. The fascinating floral biology of the genus results from its extremely reduced morphology.

The taxonomy of the genus has been confused since its first description in 1775, primarily due to poor preservation of its fleshy flowers. The most widespread species in Namibia is *Hydnora abyssinica*, distinguished by white tepals and its preference for *Acacia* hosts. *Hydnora africana*, *Hydnora longicollis*, *Hydnora triceps* and *Hydnora visseri*, a new species recently described by my group are characterized by bright orange tepals and parasitize various *Euphorbia* species. The most difficult species to locate, *Hydnora triceps*, completes its entire life cycle underground and is the only known angiosperm with both subterranean flowering and fruiting.

The floral biology of the genus is characterized by a floral sex change carefully synchronized by a clever “catch and release” insect trapping mechanism, while all members of the genus attract pollinators through the production of foul odours.

This talk will highlight these and other aspects of the floral biology of this remarkable genus that ensures reproductive success under severely limited conditions.

An investigation of the factors determining use or non-use of health services amongst disabled persons in Namibia

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Studies of health, illness and disability historically focus on physiological and economic circumstances of patients, aspects which are irrefutably objective. However, a relatively new area of study- medical sociology stresses the importance of the subject himself in treatment methods. The aim of the study therefore is to investigate the psycho-social factors which influence health service utilization patterns amongst disabled people. The study is based on a survey conducted in 5 regions (Khomas, Kunene, Omusati, Hardap and Caprivi) by the Multi-Research Centre at the University of Namibia under the auspices of Project Equitable. The sample consists of 1339 people with various kinds of disabilities who were interviewed in a questionnaire on their health service utilization patterns and how they rate a range of aspects of the health system. The results reveal that factors such as the attitude of health personnel and the quality of communication between the patient and health workers significantly influence use of health services.

Age determination and growth rate of the northern Benguela Sardine (*Sardinops sagax*)

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Estimates of the Sardine fish stock biomass at the National Marine Research and Information Centre (NatMIRC) is done through stock assessment and the models currently require an accurate age structure of the population to be known in order to estimate the growth of the stock. The number of age classes within the stock is not really known, because there is no validated age determination method. The lack of age data has necessitated the use of length frequencies to split the stock into separate cohorts (De Oliveira, Boyer, & Kirchner, 2007). However, separation of cohorts from length frequencies is not the best method for determining age structure of a stock as it proves difficult if not impossible for the application to adult fish (Fossen *et al.* 2001). In contrast, the use of otoliths is known to be a more precise method of determining age of fish (Campana, 2013). The length frequency assessment (LFA) however can only be used confidently once it is cross validated with an otolith methodology.

The main objective of this study is to determine the age composition of Sardine by means of the growth rings on otoliths and in the process compare the results with those obtained by the LFA method. In addition to that, an evaluation of the growth rate and other biological parameters will be conducted.

The area of study is the northern Benguela marine ecosystem. Random samples will be collected from the lowest depth possible to the 500m isobar along the Namibian coast, covering the area between 25°S to 17°S. Otoliths will be collected from fish during the annual small pelagic surveys in October 2013 and February 2014. Some otoliths will also be collected from commercial samples through port sampling from February 2014 to July 2014. Biological data such as length, weight, and sex will also be recorded.

Judicial Electronic Filing System for Namibia

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Department of Computer Science

The use of E-Filing in businesses and several institutions has increased dramatically over the past 10 years. Many Courts around the world have implemented e-filing systems for their proceedings.

Electronic court filing (ECF), or **e-filing**, is the automated transmission of legal documents from an attorney, party or self-represented litigant to a court, from a court to an attorney, and from an attorney or other user to another attorney or other user of legal documents(Wikipedia, 2012).

This system provides a simpler way for staff within the judicial system to upload and access case documents and significantly reduces the time and costs spent on filing manually.

This also system provides more information to Court staff, and the public in a more flexible, practical, and efficient way and to improve our court processes by reducing the cost and volume of paper filed by Lawyers. It will also provide search methods for users to easily find case documents and details about cases.

Currently the Judicial system in Namibia uses a system in which files are stored, sorted and accessed manually by the court staff, this system will significantly ease the difficulties currently faced by the judicial system in its entirety. Judges and Law practitioners will have a more simplified, secure and efficient way of handling case documents.

The Evolution of Continental Crust: implication for the development of life on earth

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The rapid progress in the analytical capabilities of current equipment and spectrometers to measure in ppb and ppm range has availed the geochemical and geology world with an

invaluable tool to measure the small quantities of Hf- Lu, Os-Re pairs that give precise fingerprint values of continental and mafic crust. The early earth had very little to no continental crust at 4.5 billion. With time the amount of continental crust has grown steadily, such that 630 million years ago, sufficient continental crust had accreted on the surface of the planet. The interaction of continental crust with the atmosphere led to a steady increase in the partial pressures of oxygen in the atmosphere. This in turn spurred living organisms that are much more comfortable with these high levels. The rise of oxygen in the atmosphere in early Paleoproterozoic first led to the formation of banded iron formations, then rain became dominant and finally carbonate horizons formed on a global scale. The interaction of CO₂-O₂ and continental crust rich in SiO₂ led to even high levels of oxygen, spurring the Cambrian explosion. The role of the continental crust in this evolution is discussed.

Synthesis, characterization and application of cation sensors using different chemosensors
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Chemical sensors (chemosensors) are miniaturized devices that can deliver real time and online information on the presence of specific compounds or ions in even complex samples. They employ specific transduction techniques to yield analyte information. Cations chemosensors are finding many application as cations are prevalent in both industry and farming. Many cation and anion are relevant in different field; therefore finding new selective ion receptor systems is the most important goal which involves sensor development.

So far, I have synthesized many chemosensors reacting different compounds such as, 2-Aminothiazole with acetylferrocene, 2,3-diaminonaphthalene with 4-dimethylaminobenzaldehyde, 1,2-phenylenediamine with 4-dimethylaminobenzaldehyde; phthalic anhydride with 2-aminothiazol, and vanillin with benzidine. The experiment on the above mention combinations were done at different conditions (different solvent, temperature, with and without acid) to see which combination works and is appropriate for cation sensor. They were stored at very low temperature to form precipitates then they will be filtered out and used for the characterization and applications.

Preliminary Studies on the Effect of Purified Lignin (Lignohumate KD) as a Feed Additive for Lohmann Brown egg layer Chickens.

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A total of 971 chickens (482 experimental and 489 control groups), weighting an average of 2 kg/head, were subjected to experiments under Neudamm Campus environmental conditions of 32°C; 13⁰C; 9⁰C and 22%; 20,2% and 16% of relative humidity, respectively. All chickens were fed with balanced ration earmarked for egg layers for a total 16 days followed by and 20 days interval (all split in two periods) and subjected to stress for 10 minutes per/day. The experimental group was given purified lignin diluted in drinking water (60gr/kg; 50gr/kg and 40gr/kg respectively) at different seasons of the year.

The objective of this study was to test the effect of lignin as anti-stressor, microorganism suppressor and triggering agent of metabolic activities. Results revealed reduction of feed intake by the experimental group of chicken, while increasing egg-yolk protein content; egg size and egg shells resistance as compared to those from the control group.

Certain chickens from the experimental group experienced difficult in releasing eggs, a fact possibly related to their size or with low fat content at cloaca. Studies will continue to identify accurate amounts of Lignin/kg necessary to improve the results in different seasons of the year, without affecting egg production and birds' health.

Keys words: purified lignin; egg production, metabolic activities, different egg sizes and chicken health

Sub-Saharan NRENs Envisaging Big Data (S-SEBiD): in the Mid 21st Century

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In cognizant of the education institutions' mammoth task of developing scientific research and collaborate among themselves, NRENs formed a consortium to collectively share and use resources to accomplish economical growth. The expansion of research resulted into the exponential growth of huge scientific data such as: astronomical data; human genomic; computational social science; petabytes of climatic observations; and stock market moves data to name a few. Such an escalating growth of data leads to the adoption of utilising the up coming Big Data. In view of this, NRENs have the obligation to get ready for the handling of the Big Data in this era. In general, developed nations adopt technology as it appears. It is against this background that the sub-Saharan NRENs should be positioned and prepared to embrace the Big Data especially in this 21st century where many countries are focused on the attainment of Vision 2030. One of the objectives of Vision 2030 is to develop scientific research which would be used to enhance economic growth in order to eradicate poverty stricken regions particularly in the

sub-Saharan. The adoption and utilization of Big Data would require the sub-Saharan NRENs to develop sophisticated software tools with the capacity to store, manipulate, capture, curate, search, share, analyse and process the exponential multitude of terabytes to petabytes of data. By doing this, the sub-Saharan NRENs would manage to handle the skyrocketing research data and be able achieve Vision 2030 in this century.

Determination of groundwater flow pattern in the Eiseb Graben aquifer based on rare earth elements, δD and $\delta^{18}O$

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Geology Department, Faculty of Science, University of Namibia, Faculty of Science, Windhoek. The Eiseb Graben is situated in the eastern part of Namibia and it is a north-eastern trending graben that is situated between the Epukiro and Eiseb Omurambas in the eastern Omaheke close to the Botswana border. The Eiseb Graben and associated lineaments seem to be a long lived, probably reactivated structure that follows the pre-existing structures of the Damara inland branch, Karoo trough, and basin structures of the Kalahari. The Omaheke region is well known to have sparse surface water; hence, groundwater is an important aspect with regard to this region. The study is aimed at producing a well defined analysis of stable isotopes of water as well as rare earth elements in order to assess the groundwater flow patterns in the Eiseb Graben Aquifer which will in turn, determine where the aquifer receives its present day recharge from. It has been found that the Eiseb Graben aquifer is hosted in Kalahari sequence strata which is also known as a thick blanket of Phanerozoic and recent sediments which covers most of the north-eastern Namibia and effectively masks the older crystalline and sedimentary bedrock formations. Since the mid 1970s the Eiseb Graben aquifer was considered to be one of the major aquifer systems in the area around Gam in the Eiseb. The aquifer consists of fine to coarse grained sandstone which is partly calcareous and partly gravelly and conglomerate. Isotope and hydrochemical analysis have proved that the aquifer system has indeed been receiving recent recharge and is of suitable quality for human consumption.

Production, characterization and application of activated carbon from bird plum or eembe (*Berchemia discolor*) fruit stones.

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Activated carbon is a form of carbon which has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions (Lotfy et al.,2006). The objective of this study was to optimize the production of activated carbon from a local agroforestry waste material (*Berchemia discolor* or *eembe*), by investigating the conditions in which production yields the maximum amount of activated carbon. Several tests, including iodine number test, were conducted to examine characteristics of the activated carbon produced and evaluation in its removal performance in wastewater treatment is currently in progress, as well as comparisons to commercially produced activated carbons and those produced from different raw materials. The carbons produced in this study were carbonized and activated at different temperatures and in a variety of phosphoric acid concentrations respectively to find the optimal conditions of production and to compare the performances of the different activated carbons, in wastewater treatments. The samples carbonized at 300°C have so far given the highest yield of about 65%. Carbonization was done in the absence of nitrogen gas, to investigate how this change in production conditions would affect the activated carbon produced, as the omission of nitrogen complexes on the surface of the carbons is believed to have an effect on the surface polarity and therefore the interaction with polar pollutants.

SharePoint application for online collaboration

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The government of the republic of Namibia, through collaborative efforts with the private sector and international organizations are on the mission to improve the quality of education in the country. One such way among others is to provide facilities such as computer machines and internet to every school across the country.

Some organizations have already donated some computers to several schools in both urban and rural areas across the country. These computers are being used by school secretary staff to help teachers produce simple documents such as question papers, class lists, and official letters among others using the Microsoft office tools such as Word Processing and Excel.

The availability of computers and internet could further be used to create a workgroup platform that would allow for teachers to work together and share data between schools and the ministry of education's regional office. However, there seems not to be adequate mechanisms in place to put these computer facilities to better use.

Assuming there is availability of internet, which is also under plans for provision, the educational system could be upgraded so that schools would have online collaboration, The Microsoft Office package additionally comes with very useful tools such as Microsoft Outlook and Microsoft SharePoint workspace, which, if made usable, would make teachers be able to share resources

such as lesson plans, notes and teaching strategies among others; this would help them to easily prepare lesson plans and other material for teaching.

They would also be able to electronically submit continuous assessment schedules to the ministry of education's office plus any other documents as requested.

A GIS-based drastic model assessment of groundwater vulnerability to heavy metal contamination in the Tsumeb area, Namibia

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Tsumeb is a copper mine town situated in the Oshikoto region in the Otavi Mountain land (OML). The study area is situated in the longitude range of 17.62141533 to 17.81588603 and latitude range of -19.33702057 to -19.15355021. Groundwater has become a major source of drinking water and in Tsumeb dolomitic aquifers are common in providing water for local community. Tsumeb is subjugated by carbonate aquifers such as the limestone and dolomites customarily yield fresh water but are relatively prone to groundwater contamination. Vulnerability of groundwater shows the risk high or low of groundwater to heavy metal pollution. The study aims to assess the level of vulnerability of groundwater to heavy metal by studying the geology and hydrogeology of the area, through the vulnerability map that will be produced. In addition the study also aims to use the DRASTIC index method in assessing the vulnerability of the area. Lastly to use GIS tools to create a DRASTIC vulnerability map and hydro geological model.

At the end of the study with the use of the vulnerability index map; areas that have high and low potential to contamination will be delineated. The success of this study will enable the creation of a groundwater model and a map. The models and maps will pave way in finding possible remediation techniques to heavy metal contamination. This will also help provide the locals with better quality drinking water and water used for other domestic purposes. The vulnerability map may also become a useful tool to land management plans, environmentalists, hydrogeologists and town plans.

KEYWORDS: Groundwater, Vulnerability, DRASTIC, GIS, Tsumeb, Carbonate Aquifers.

The synthesis and characterization of selected bioactive metal complexes

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As the size and complexity of today's problems addressed, to mention a few, spread of protozoan diseases and deaths of many especially Africa, Namibia to be specific, increase and therefore new techniques must be developed to effectively fight protozoan diseases. In Namibia people rely on anti-malaria drugs such as Chloroquine and Hydroxychloroquine in malaria infested areas like Oshikoto, Kavango, Otjiwarongo and other Northern regions. The metal complexes being investigated will have extensive use in the treatment of malaria and other protozoan diseases. The metal complexes will serve as an indication of the potential new drug discovery. furthermore motivation of United Nations agencies—the World Health Organization (WHO 2012) and the United Nations Children's Fund (UNICEF) explains Africa's malaria problem and calls on the global community to step up its efforts to combat protozoan diseases. In Namibia only seven (7) patents have been discovered as a new class of compounds with a very high biological activity against malaria and other protozoan diseases. The experimental work produced several crystalline metal complexes with several colours that are to be tested for biological activities. The IR spectrum of the complexes were obtained and they revealed the presence of 5-Bromoisatin functional groups with string bands from 2000 cm⁻¹ and 4000 cm⁻¹. Qualitative chemical test will be done for further functional groups.

Comparative analysis of vitamin C content in processed indigenous vegetables using HPLC and titration method

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Indigenous vegetables are a good source of nutrition for many Namibians especially in the remote parts of the country. A lot of these vegetables are consumed annually such as Cleome gynandra known as Ombidi, Amaranthus thunbergii known as Ekwaka and Hisbiscus sabdrattia known as Mutete just to mention a few. Vitamins are the important constituents of nutrition for mankind and other living creatures; for proper growth and healthy life (J.Chem, 2013). Ascorbic acid (Vitamin-C) belongs to a class of vitamins which are water soluble. Ascorbic acid is an unusual vitamin in that it can be synthesized by most animals; however it cannot be made by humans, primates, guinea pigs and fruit bats this is due to the fact that the six step pathway that converts glucose to Ascorbic acid is absent in this organisms do to the absence of the required enzymes (Brody, 1999). The focus point of this research will be a comparative analysis of Vitamin C content in processed indigenous Vegetables abundant in Namibia using the HPLC and Titration methods. The peak height of the Ekwakwa sample at 238 nm was 1,330 (mAU) which is the highest followed by the Ombidi sample which had a height of 967 (mAU) and the shortest peak height was Mutete which was 722 (mAU). Titration still to be done.

Astronomy for the new comer (AFTN)

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Many people today possess little knowledge about astronomy. Are there any software that exist to teach someone who is just beginning to learn astronomy? Namibia alongside Chile and Hawaii have the best clear skies for star gazing and astrophotography in the world. Every year many tourists from various countries come to experience star gazing under the Namibian sky because it contains very little artificial light in comparison to many other countries (The Namibian, 2006). Though star gazing and astronomy are very intriguing, they are not so popular in Namibia. Astronomy is a very intimidating science, and the newcomer faces a number of hazards. Some of which are;

- The vast scale of everything
- Luck of equipment
- Complex astronomical software
- Most books and software do not arouse the zeal to learn more because some background knowledge about astronomy is required in order to understand them better.

It is a reasonable but quite incorrect assumption to imagine that proper astronomical research and learning can only be done in an observatory or at schools and universities that offer astronomy. After a survey that was carried out, it was discovered that more than 85% of people in Namibia lack, even the basic, knowledge about astronomy.

It is important to study astronomy because it is a "big" subject. It's essentially the study of the universe and the workings of all its parts, both individually and collectively. We live in the "reality" of the universe, and by understanding it better, we might be able to know how it began, how it is evolving, and where it is going to end up.

Many people that have no background in astronomy would like to expand their knowledge but unfortunately there is no software that has been developed to teach, the above mentioned, to the newcomer. Many astronomically related software that exist today are too complex for the less knowledgeable enthusiast. They can only be used by professional astronomers and high level astronomy students.

Astronomy for the Newcomer (AFTN) will be an interesting social media that will also involve teaching and sharing ideas in astronomy and cosmology to people that have little or no background knowledge in astronomy. Unlike the current existing software and websites AFTN will include a social space where people can interact and discuss about various topics. It will also serve as an advantage to those that want to study further in any astronomy related field, for it will give them the background knowledge needed.

People understand the science of a physical phenomenon better when they visualize it. This website will be able to upload and download live simulations made by EJS (easy java simulations) to illustrate planetary motion and other astronomically related motions.

Design, synthesis and biological testing of capsaicin analogues

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This research experiment is focused on designing and synthesizing capsaicin analogues that will be biologically tested for enhanced antibacterial and anti-infective properties. Capsaicin as a natural derivative from chillies (*capsicum annum* genus) has been confirmed to possess a variety of medical applications such as prevention of certain strains of cancer, heart disease, stroke, blood clots, blood pressure, coughs and colds and stomach ulcers. As such it's a viable source for development of a new generation of drugs that may have enhanced medical properties compared to the natural capsaicin. Habanero chillies (*Capsicum chinense*) will be used as they possess a high content of capsaicin. Extraction from the chillies is done by simple solvent extraction in Ethanol is used as it requires very simple apparatus. The research also includes characterisation and quantification of capsaicin by IR spectrometry and HPLC. The capsaicin analogues are synthesised by replacing the –OH group on the ring with different alkyl groups. Since capsaicin and dihydrocapsaicin are difficult to separate in their natural state, they will only be separated after the alterations to their structures. Thereafter the analogues will be tested for antibacterial and anti-infective activity by the UNAM biological department. The results will then be related to the activity of the natural capsaicin to see how the activity has been affected, whether it will be enhanced or deteriorated.

Development of a liquid-liquid microextraction method for the simultaneous determination of illicit psychoactive drugs used by motorists in Khomas region

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An increase in fatal road accidents in recent years in Namibia was identified as the third leading cause of death in Namibia after HIV/AIDS and malaria. Investigation of the use of psychoactive drugs by motorists and their contribution to fatal road accidents in the country has been neglected and there are currently no specific reports on the prevalent use of these drugs by drivers. According to the Road Traffic and Transport Act 22 of Namibia (1999) it is illegal to drive a vehicle under the influence of liquor or narcotic drugs. In this research, a rapid liquid-liquid microextraction (LLME) method together with gas chromatography-mass spectrometry

(GC-MS) will be developed by comparing the effectiveness of the different LLME techniques on the simultaneous determination of the drugs under study and optimizing the parameters and variables that can affect the extraction of the drugs. The best technique might have the potential to be implemented in future as a convenient, cheap, environment friendly and fast routine drug test in forensic laboratories. Furthermore, an investigation of blood samples from traffic law offenders in Khomas region for the presence of the readily available psychoactive drugs (cocaine, cannabis and amphetamines) in the country will be performed. The most frequently used psychoactive drug(s) and the frequency distribution of psychoactive drug use in the Khomas region will be determined. (Permission to carry out this research was granted by national forensic science institute (NFSI), Ministry of Safety and Security in 2013 and all analyses will be carried out at the NFSI laboratory.

Timetable allocation system

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Many students have experienced at the start of each semester class clashes and delays mainly due to the fact that lecturers need to reorganize the predefined timetables because they do not comply with their respective schedules. As it turns out, it's not the lecturers themselves that compose the original timetables, but a panel of individuals who design the timetable for the University. This project goes by the assumption that when the Lecturers themselves compose the timetables it will help to alleviate class clashes and unnecessary delays that are so common yearly. Through the construction of a thorough and well defined database, along with the relevant relationships and constraints, the Timetable Allocation System will prevent lecturers from choosing the same time for a class that is in the same venue.

The lecturers will be able to log in to a web interface and only view modules that have been assigned to them. This is a security feature to avoid them editing another lecturer's time slots. After the necessary changes have been made, the data is committed to the database.

On the student side, they also log in to the system through the web interface. To cater for all students of various I.T backgrounds and to make the system as simple as possible all the processing and allocation is done in the background. Hence, the system requires very minimal user interaction. According to the logged- in student's ID number, the system determines what modules are relevant and composes the accurate timetable to the student. The student has the option to print the timetable.

Mapping gender-specific pattern in HIV testing and condom use in Namibia

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Background: Gender variation in the spatial pattern of HIV testing and condom use in Namibia was undertaken using Bayesian hierarchical spatial mapping techniques based on data from Namibia Demographic and Health Survey (NDHS) carried out between 2006 and 2007. The main objective of the study is to examine gender-specific spatial variation in HIV testing and condom use in Namibia for targeted health promotion interventions. Methods: A number of basic Bayesian Structured Additive Regression (STAR) models were fitted and then followed by shared component models. Firstly, we modeled HIV testing and condom use in males and females with fixed effects such as educational level, frequency of reading newspapers and magazines, frequency of listening the radio, frequency of watching television, wealth index, times away from home, smoking, alcohol consumption, employment status, age at first sexual intercourse, type of residence and marital status whereas spatial references to the communities were modeled as structured and unstructured spatial effects. In the second modeling approach, HIV testing and condom use in males and females were modeled jointly with a shared component for random effects. Results: Common and divergent patterns of HIV testing and condom use emerged. Common areas among men and women on HIV testing and condom use were observed in Khomas, Oshikoto, and Oshana, while divergent Caprivi and Karas. Urban influence was also captured in the model. Conclusions: The study underscore the usefulness of Bayesian hierarchical mapping model in highlighting areas lagging behind in the uptake of HIV testing and condom use with emphasis on differences between men and women in the same area. The information will be valuable for guiding public health actions that are targeted at the overall reduction of risk-sexual behaviors through HIV testing and the use of condoms.

KEYWORDS: gender disparities, spatial variation, HIV testing, condom use, Namibia

Preparation and GC-MS analysis of essential oils from the Bushmen's candle, *Sarcocaulon mossamendense*

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Sarcocaulon Mossamendense is an indigenous aromatic plant that grows in the far north-eastern (Kunene Region) part of Namibia. The plant samples were collected by picking up the dead plant parts that has fallen from the main plant. Essential oil was extracted from this plant using steam distillation and solvent extraction (dichloromethane) methods. These oils contain volatile organic compounds and were analyzed by gas chromatography - mass spectrometry (GC-MS) using a non-polar column and using helium as the carrier gas. More than 60 different compounds were tentatively identified by comparison of their mass spectra with a mass spectra library. The

identities of some of the constituents could be confirmed by comparison of their experimentally determined retention indices with published data.

Micronutrient and alcohol analysis of Namibian indigenous foods & beverages using HPLC & alcolyzer

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The different cultures in Namibia depend on their own indigenous foods and beverages for nutrients to sustain good health conditions. However, little is known on the food composition of their indigenous foods to the indigenous people. It is important that foods are labelled by their composition for Recommended Dietary Allowance (RDA) purposes. This research work is carried out to determine micronutrient composition of selected Namibian traditional foods (Oshigali, Omaere and Ekaka) and beverages (Oshikundu, Omalovu giilya and Omagongo), further more the alcoholic content of the alcoholic beverages is to be determined. The micronutrients for analysis include three water-soluble vitamins (C, B1 and B2), two fat-soluble vitamins (E and A) and amino acids. The concentration of the micronutrients will be determined using High Performance Liquid Chromatography (HPLC) and alcohol content of beverages will be determined using an Alcolyzer. The alcoholic content of beverages in concentration of v/v was found to be Oshikundu 2.55%, Omalovu giilya 3.13% and Omagongo 4.97%. Other analyses are yet to be completed with their interpretation.

Identification of anti-plasmodial compounds from ethno medicinal Namibian plants used to treat febrile illnesses

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Malaria is a health concern for sub Saharan Africa and there are few effective treatment options. Namibia has diverse flora which may have potent anti-malaria compounds because it is used to treat febrile illness. Current artemisinin based drugs are based on plant extracts and this study

investigated the chemical and anti-plasmodial properties of three Namibian plants for potential new anti-malaria compounds.

Mundulea sericea (shoots and leaves), *Diospyros mesipiloformis* (roots and leaves) and *Cyphostemma cf. Puberulum* (whole plant) were extracted with methanol and distilled water, and screened for major anti-plasmodial phytochemical compounds by thin layer chromatography. Total alkaloids and phenolics content in crude methanol extracts were quantified by spectrophotometric methods. In vitro anti-plasmodial activity of the crude methanol and aqueous extracts at 5, 10 and 50 µg/ml at 24 and 48 hours was performed on *P. falciparum* 3D7A. Fractionation of promising extracts was carried by gravity Sephadex LH 20 column eluted with methanol: DCM 1:1v/v and n- hexane: ethyl acetate 8:2 v/v for the first and second round respectively. Anti-plasmodial assay of fractions obtained was carried out at each round. Preparative Thin Layer Chromatography (TLC) was used to subsequently identify spots on TLC plates in promising fractions. Finally, HPLC was used to confirm the phytochemical groups of the spots.

Mundulea sericea (shoots and leaves), *Diospyros mesipiloformis* (roots and leaves) and *Cyphostemma cf. Puberulum* (whole plant) used in traditional setting for malaria treatment were identified. TLC analysis of the crude extracts reveals the presence alkaloids, flavonoids, terpenoids, coumarins and Anthraquinones. Promising anti-plasmodial activity (IC₅₀ values 4.5802 - 5.5132 µg/ml) of the methanol and aqueous extracts with dose dependent effect for 24 and 48 hours was shown. *Diospyros mesipiloformis* (roots and leaves) and *Cyphostemma cf. Puberulum* (whole plant) were selected for isolation of anti-plasmodial compounds by anti-malaria bioactivity guided fractionation. Furthermore, first round of Fractionation yield separated fractions that vary phytochemically as revealed by TLC. Anti-plasmodial activity of the first round fractions indicated improved activity compared to initial extracts for 24 and 48 hours. Fractions that indicated high anti-plasmodial activity proceeded for second of fractionation and are currently being assessed for anti-plasmodial activity and chemical profiling by preparative TLC and HPLC.

Minerals alteration at Matchless Mine, Western Extension Orebody

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The Matchless Amphibolite belt (MAB) hosts several volcanogenic-exhalative, stratiform and strata-bound cupriferous pyrite deposits containing subordinate and variable amounts of Zn, Cu, Pb, Ag and Au. Apart from that, Volcanogenic massive sulphide (VMS) deposits are also significant sources for Co, Sn, Se, Mn, Cd, In, Bi, Te, Ga and Ge. The Matchless deposit which is the main focus of this project, form part of a cluster of 18 individual ore bodies along the Matchless Amphibolite belt including Gorob, Otjihase, Hope, Ongeama, Ongombo and

Otjituiezu deposits. During volcanic- exhalative ore forming process, it is believed that intense alteration processes of silicification, chloritisation, sulphidation, and carbonatisation took place, together with the formation of the structural hanging wall stringer zone. However, an additional alteration process of sericitization is also observed on the surface around the gossan. Due to several deformation episodes and clear metamorphism events of unknown extent; the original Matchless deposit rock types is still an argumentative topic, with a few suggestion of either basaltic or metasedimentary origin. Furthermore, different aspects have clearly shown that hydrothermal alteration and deformation controls the style of mineralization at Matchless.

Mushroom analysis: nutritional and medicinal evaluation of local mushrooms of Namibia
(*Agaricus bisporus*, HK 35, *Pleurotus sojar-caju*, *Pleurotus florida* and *Lentinula edodes*).

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Mushrooms have been evaluated for their nutritional status on the basis of their chemical composition. Edible mushrooms have long been considered to have medicinal value and to be devoid of undesirable effects, (Ayodele & Okhuoya, 2009). This research focused on determining the mineral and phytochemical composition of selected species of mushrooms found in Namibia local shops, the *Agaricus bisporus*, *Pleurotus sojar-caju*, *Pleurotus florida*, HK 35 and *Lentinula edodes*. Dry fruit bodies were used for extraction because of easier preservation and treatment. Polysaccharides and Phytochemicals were set to be determined but because of the unavailability of the lyophilizer purification of polysaccharides would not be done and gallic acid needed for phytochemical calibration curve phytochemicals would not be quantified. Also because of time remaining before the due dates mineral content was focused upon. Two methods for sample preparation were made use of in mineral analysis: 1. Wet ashing. 2. Treatment with per chloric acid after nitric acid digestion. Analysis was done using Inductively Coupled Plasma (ICP) spectroscopy. The first set of results show that these five species are very low on toxic metals such as Cd which is below the detection limit, as well as Ag, Co, Cr, Ni and Pb which are as low as below 0.1 ppm. Fe and Zn were well detected for some of the species above 0.1 ppm. The second result includes analysis of forty-four metals instead of nine from the first and these results are still to be processed to calculate the percentage content of each metal if present and the presence to be noted as well. All species however show content above 10 ppm in P, Mg and K while sample B and E show high Na. Sample E show high in aluminium with the other meals mentioned above.

Synthesis and characterization of metal complexes derived from 5-methylisatin thioligand derivatives

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Metal complexes are of considerable interest because of their chemistry and potentially beneficial biological activities, such as antitumor, antibacterial, antiviral and antimalarial activities. There is limited information on Metal complexes and thiosemicarbazones ligands about their antibacterial, antifungal and anti-amoebic activity, (Journal of the Serbian Chemistry Society.2008.). The metal complexes synthesised so far in this study are a product of 5-Methylisatin thio ligand and Copper (II), Nickel (II), Manganese (II), Iron (II) and Cadmium (II) metal ions. One of the most promising areas in which thiosemicarbazone compounds are being developed is their use against cancer and the presence of a metal ion increases the activity or contributes to mitigate the side effects of the organic parent compounds, (The Open Crystallography Journal, 2010). The synthesized metal complexes will be recrystallized first before starting with characterization process to ensure that characterization is done on pure complexes. Proton Nuclear Magnetic Resonance (NMR), Mass Spectroscopy Data and Fourier Transform (I.R) are the tests which would be done in Namibia. After those tests have been completed, pure metal complexes will be sent to partner Universities for Biological activity testing. Once partner Universities send the results back, interpretation of the results will be done and the final research project report will be made available.

Estimation of multidimensional integrals using Monte Carlo method

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Many applications, for instance in finance and in physics, require the calculation of high dimensional integrals. Useful approximations are, however, very difficult to find when many variables are involved. The Monte Carlo method is frequently used to approximate these integrals. This paper study Monte Carlo techniques in solving multidimensional integrals. These techniques include Acceptance-Rejection Method for generating random numbers and Crude Monte Carlo Sampling Method. This takes us to the Laws of Large Numbers Theorems which describes the result of performing the same experiment a large number of times. In addition, we show how Monte Carlo methods introduce numerical error. We end this study with the numerical results performed on a four dimensional integral.

Natural radioactivity measurements in soil samples of the Kupferberg waste disposal site, Windhoek

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Naturally occurring radioisotopes are present in the soils where they decay and emit hazardous radiation. Such Radioisotopes are Uranium-238, Thorium-232 and Potassium-40. The ionizing radiation emitted by these radioisotopes could pose a serious health hazard if the concentrations of the isotopes in the soil are high. It is for this reason that the concentrations of these radioisotopes in the soils of many cities and towns have been studied by many scientists and researchers. In the case of waste dumpsites such as the Kupferberg waste disposal site in Windhoek, the wastes are generally believed to be hazardous to health so that there is hazard from the radioisotopes in the soil and from the waste. It is therefore very important to know the concentrations of the radioisotopes in the soils and determine the level of radiation to which the people around the sites are exposed.

The Kupferberg waste disposal site is in the south western part of the city of Windhoek along the Gamsberg road and it is only about 7 km from the University of Namibia. A total of 30 soil samples were collected from three large areas of the site: hazardous waste area, general waste area and outside the site. The samples were processed and sealed in 500 ml polythene bottles. The specific activities of the radionuclides ^{238}U , ^{232}Th and ^{40}K in each sample were subsequently analyzed using a high-purity germanium (HPGe) detector.

The preliminary results obtained show that the concentrations vary from 19.1 Bq kg^{-1} to 47.5 Bq kg^{-1} for ^{238}U , 22.5 Bq kg^{-1} to 65.7 Bq kg^{-1} for ^{232}Th and 344.0 Bq kg^{-1} to 958.2 Bq kg^{-1} for ^{40}K . The corresponding mean effective dose varies from 0.05 mSv/y to 0.11 mSv/y all of which are less than the maximum permissible dose of 1 mSv/y recommended for the public by the International Commission on Radiation Protection (ICRP). These results indicate that the Kupferberg waste disposal site has a normal background radiation.

Towards a better understanding of type 2 diabetes: what are the structures of starch hydrolysates by luminal amylases?

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The major source of energy in humans is starch. The digestion of starch in monogastric animals, including humans starts in the mouth. It may continue in the stomach. Pancreatic amylase further digests starch as the food moves through the small intestines. Mucosal enzymes finally convert starch structures into glucose for absorption. However, the digestion of starch has implications

on health, especially with regards to type 2 diabetes. The rate of glucose release and/or delivery into the blood can be both beneficial or a cause of health concerns. The rate of glucose release depends on the starch hydrolysates that evolve during digestion. Yet, the molecular structures produced during the digestion of starch in the gut are not well understood. This paper presents results concerning the impact of oral digestion on starch. Normal corn starch was cooked at 1:0.7 (T0.7) or 1:2 (T2) starch to water ratios. It was also dispersed using dimethyl sulphoxide (TD) to remove the effect of granular structure. These starches were then subjected to salivary amylase at conditions mimicking human oral digestion. Using GPC, different and complex mixtures of hydrolysates with broad size-distributions resulted from all the hydrolysed samples. For instance, the smallest dextrans (DP < 30) constituted 35% in TD and only ~20% in both T0.7 and T2. These results show that the amount of water present during processing of starch affects structures of salivary amylase hydrolysates, which can possibly impact on glucose homeostasis.

Habitat requirements and population ecology *Juttadinteria albata* and assessment of its performance in post mining substrates at Namdeb's Sendelingsdrif Diamond Mine.

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Juttadinteria albata, a plant species found in the Succulent Karoo of the southern Namib, occurs only in a small area near the Orange River. The population is likely to be affected by mining for diamonds. To prevent an increased risk of extinction of this species, it is important to understand its ecology better with a view to restoring its population after mining. The objectives of this study are to determine the key environmental factors that may be associated with *J. albata*, to describe its population structure, and to determine the most suitable post mining substrate for restoration. The study is divided into two components, field and heap experiment and took on quantitative designs. A random method was developed to survey the whole mining area and its surroundings. Plant identity and dimensions as well as environmental factors were recorded in each quadrat. *J. albata* was grown on twelve different heaps of a mixture ratio between three different post mining waste materials to test its affinity for different slopes and aspects. From preliminary data analysis, the abundance of *J. albata* was highest in clay to clay-loam, and silt-clay-loam soils possibly due to the ability of clay to hold more moisture. Also, *J. albata* abundance was highest on southern steep to level slopes probably because fog and rainfall comes from southern direction. Furthermore, *J. albata* was most abundant in the following habitats; proto terrace, sheltered gully and shallow soil on ridges. Finally, *J. albata* grows at various slope angles, slow infiltration rate and a high percentage rockiness cover.

Development of a solid phase extraction technique for the quantitative determination of hormone pollutants in water by gas chromatography (GC)

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Namibia is the driest sub-Saharan country in Africa. Namibia's capital, Windhoek, reclaims sewage water for domestic use and the risk associated with sewage effluent and reclaim should be closely monitored. Sensitive analytical methods to determine the presence of hormones and other pollutants are of the utmost importance. In this study an analytical method was developed for the quantitative determination of steroids in water. The method employs solid phase extraction for the isolation and pre-concentration of the analytes, followed by gas chromatography analysis. The resulting method can be used for the sensitive determination of all synthetic estrogens, natural hormones and other steroids in water.

The isotopic composition and hydrochemical characterization of thermal springs in central Namibia

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Very little is known about thermal springs in Namibia and the studies that were done on thermal springs in Namibia were done over 80 years ago. Therefore it is possible that the hydrochemistry and the isotopic composition of thermal springs have changed. The source of the heat of the water in thermal springs is not known, the genesis of the water is also under investigation. Hence this study's aim was to reassess the hydrochemistry, deduce the origin and source of heat of thermal springs in Namibia. The results were obtained by going to the field, collecting samples of thermal springs, around the country, for lab analyses and taking field parameters such as Temperature of the spring water, pH, Oxidation-Reduction Potential, electrical conductivity and others. From the field results obtained, the temperatures of the thermal springs are in the range of 42°C-70°C, this shows that the depth at which the water travelled has to be at least 1800 meters. The water isotopes $\delta^2\text{H}$ (‰) are in the range of -36 and -56, while the $\delta^{18}\text{O}$ (‰) are between -5 and -7. These values are typical for geothermal water originating from precipitation. The hydrochemistry of the thermal water shows values of cations that are around 200 mg/l and anions in springs that are up to 1600 mg/l, showing the dissolution capabilities of thermal water around the country.

The Petrography and Geochemistry of EPL 5203, South of Rehoboth-Western Portion in Swartskaaap Farm, Namibia.

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The Rehoboth copper-lead-zinc mineralization has been discovered in the 1970s in the Swartkaap area. The copper-lead-zinc mineralization occurs within the Kamasis formation granite gneiss, which is the oldest member of the Archean Rehoboth Inlier. The rocks in this area are the rocks of the Archean and Proterozoic ages and appear to have been undergone two or more types of deformation. The mineralization is associated with shear zones within granite gneiss which are short en-enclelon features and trending 040° magnetic dipping roughly 55° towards the north-west. They also appear to be represented by quartz biotite schists surrounded by altered granite gneiss. Copper-lead and zinc being one of the base minerals on the planet and has been used for more than 10 000 years are still in demand because the world leads to the increase in exploration of these base metals. The emphasis of this research is on the petrography, geochemistry and mineralogy within EPL 5203, to investigate how the copper-lead-zinc mineralization has extended and distributed in the area from the already available information.

Small area estimation of the total household income for the city of Windhoek

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Small Area Estimation involves fitting statistical models to generate statistics for area where samples size of the survey data is insufficient for generating precise estimates. Surveys information is commonly collected to yield estimates of quantities for larger geographical area, for example a Region. However the estimates of those quantities at much smaller geographical area are often of interest and the sample size in these areas are generally too small to give useful and reliable results. Small area estimation is used to make inference about those areas with greater precision than the direct estimates, by employing the indirect techniques to fill the gap.

Statistics is needed to make informed decision and it's more needed at small area such as town and city for proper planning and distribution of services by the municipal. One such problematic situation is the unequal distribution of income, how can the city provide basic services to the community if there is no information about the distribution of income? Since there are no regular surveys gathering information on household's income at local level, monitoring of income distribution and other services provision at city/town level become difficult. Therefore, the focus of this study is to provide estimates for total household income for the constituency in Windhoek using Small area Techniques.

The study will use a quantitative cross-sectional design with an analytical research approach. The study will be based on regression modeling applied to the secondary data from the NHIES 09/10 survey. The sample size of this study is 844 households from a population 77,447 households in Windhoek. Data will be analyzed using STATA and R to fit a generalized linear mixed model (GLMM) incorporating conditional autoregressive model (CAR) approach.

The stratigraphy, geochemistry and structure of Valencia north area (Valencia uranium deposit) with emphasis on the Salem suite granites, Namibia

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Uranium mineralisation in Namibia is concentrated in sheeted leucogranites within the southern Central Zone of Damara Orogen formed about 500 Ma via the collision of Kalahari and Congo Cratons. Major deposits in the central zone are namely Valencia, Rössing, Huab and Gaonikontes which are all of igneous origin with uranium mineralized in sheeted leucogranites. These sheeted leucogranites range from tonalite-alkali feldspar granites. Six types of the leucogranites (formerly termed alaskites) have been identified mainly pre-D3 types (A-C)- usually barren and post-D3 (D-F) which are more prospective for uranium. Leucogranites are highly variable in texture from fine grained-pegmatitic mainly composed of quartz and feldspar and less than 5 % mafic minerals. The Valencia Joly Zone geology is fascinating displaying rock units from the Etosis Quartzite-Karibib Cordierite Schist with Damaran intrusives intruding frequently. Field observations showed that the granitic metasediments were intruded in different tectonic times, with intrusives namely: Grey biotite granite, porphyritic feldspar granite and sheeted leucogranites. Grey porphyritic Salem Granite was emplaced in Khan Formation and other formations locally around a major anticlinal structure, the basement inlier and Damaran rocks were intruded by the leucogranites with basement representing an eroded anticlinorium plunging northeast. The Valencia deposit located on farm Valencia 122 between Arandis and Usakos (75 km away) and Northeast of Rössing Mine and the deposit is considered to be of low grade and moderate tonnage. The Joly Zone area is situated north of Valencia Main about 500 m away and it is considered to be an extension of the main deposit. At Valencia North radiometric anomalies occur within the Salem Suite granites which are known to be barren in the Central Zone (CZ). This radiometric anomaly was identified in 2006 during a ground geophysical survey and since then no intensive geological studies have been conducted in this area. Therefore this study aims at investigating the geology of Valencia North with particular emphasis on the local stratigraphy, structural evolution and the geochemistry of the granites. The primary purpose of the thesis is to study uranium mineralisation of the equigranular granites and leucogranites of the Valencia North area, comparisons while be made in regard to the geochemistry and uranium concentration. Methodological features included geological mapping which yielded a much

detail map compared to the current base of the area, further more core logging was carried out to supplement the ground map and study the geology of the area at depth. At depth the Valencia North area is dominated by Salem Suite equigranular granites (porphyritic and biotite granites) with occasionally at the end of boreholes ending in an arkosic quartzite or dolerite. The samples for geochemical analysis were prepared by crushing and milling them into a homogeneous powder and send to the geochemical lab for chemical analysis. The primary methods utilized by the latter were XRF and ICPMS methods, XRF aimed to analyze the major minerals in the granites whilst the ICPMS analyzed the trace elements. The results were rather negative particularly in the equigranular granites, yielding an average of 20 ppm of U compared to leucogranites with about 1300 ppm of U.

Phytochemical and antioxidants analysis of the *Eucalyptus globulus* leaves

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Eucalyptus globulus commonly known as a “Blue gum tree” was discovered as a medicinal plant on an island of Tasmania in 1792 by a French explorer (Mohammad, 2011). The study aims to screen for phytochemicals, to determine antioxidant activity of crude extract of the leaves of *Eucalyptus globulus* tree and to extract essential oils from the leaves. Preliminary screening and TLC confirmatory test of phytochemicals were carried out, the ethanolic leaves extract was prepared by homogenization extraction method, and the extract was used for the determination of total polyphenols, total flavonoids and antioxidant activities, all these were done by using UV-spectroscopy technique. Screening of phytochemicals indicated the presence of flavonoids, alkaloids and polyphenols. The scavenging assay indicated that the extract had 0.029% inhibition. Conclusion: The positive results serve as an indication that *Eucalyptus globulus* leaves extract might be exploited as natural antibiotic for the treatment of several infectious diseases caused by various microbes and could be useful in understanding the relations between traditional cure and current medicines.

Extraction of essential oils and its analysis is still to be done

Assessment of the Quantiferon TB Gold In-Tube test for the diagnosis of tuberculosis in the Namibian patients

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Namibia had a TB case notification rate of 634 per 10 000 population in the world in 2009. TB diagnostic methods especially the conventional culture to detect *M. tuberculosis* takes long to produce results and those with active TB can spread the infection. The immunodiagnosis provides diagnostic methods for *Mycobacterium tuberculosis* (TB) by interferon-gamma (IFN- γ) release assays. The in-vitro Quantiferon (QFT) test uses an enzyme-linked immunosorbent assay (ELISA) with specific antigens of *M. tuberculosis*. The usefulness of the method was assessed and its responses were compared in HIV positive and negative participants. The levels of the IFN- γ in QFT supernatants of TB participants were evaluated to measure treatment response. One hundred TB suspects ≥ 18 years old, HIV positive and negative from Katutura State Hospital were recruited to the study. Sputum for direct microscopy and culture, and blood for QFT ELISA were collected. TB cases were followed at 2 months and 6 months on treatment and samples were tested. The sensitivity of QFT was 65.7%, [95% CI 47.7-80.3%] and specificity was 53.3%, [95% CI 40-66.1%] compared with clinical diagnosis based on sputum culture. A statistical significant association between QFT results and TB diagnosis/ *Mycobacteria* Growth Indicator Tube (MGIT) culture results was found (chi-square = 6.9, $p = 0.032$). A difference in QFT results of HIV positive and negative participants was revealed (chi-square = 12.2, $p = 0.002$).

Laser applications in mining (Research project)

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The overall purpose of this research is to show advances made in laser application to mining of which change the current conventional method of drilling and surveying techniques and advocate the idea that LIDAR technology and laser drilling is viable and efficient. Tremendous advances have occurred especially in terms of laser power generation, efficiency and transmission capabilities that are now being made available for use in the mining industry

Cloning and sequence analysis of starch biosynthesis gene fragments encoding ADP-glucose pyrophosphorylase (AGPase) small and large subunits from marama (*Tylosema esculentum*)

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Starch is the most important storage material in plants and it is a major carbohydrate source for human and animals. Starch is synthesized through a series of enzymatic reactions including ADP-glucose pyrophosphorylase (AGPase). AGPase which catalyses a rate limiting step in

starch synthesis, is a heterotetramer comprised of large and small subunits in plants. *T. esculentum* is an indigenous and underutilized leguminous oil seed crop native to Kalahari region of southern Africa. The bean has been reported in terms of the agronomic practices and its potential in becoming a starch crop for the future. However, there is no understanding of the molecular basis of starch biosynthesis genes in marama as this has not been reported. Herein, a PCR strategy was used to clone AGPase small and large gene fragments using degenerative primers designed at the conserved motif of cloned plant AGPase small and large subunit genes. A 366 bp AGPase small subunit gene fragment encoding 121 amino acids and a 360 bp AGPase large subunit gene fragment encoding were cloned from *T. esculentum* using a PCR based method. BlastX search showed that the AGPase small subunit gene fragment shared 96% homology with *Glycine max* AGPase small subunit isoform 1 and 95% with *Cicer arietinum* AGPase small subunit isoform 1. The AGPase large subunit showed homologies to various AGPase large subunit genes in the Genbank database including 96% to *Glycine max* and 94% *Medicago truncatula*. The deduced amino acid sequences for AGPase small subunit exhibited high levels of sequence identity (86.49-96.40%) with other AGPase small subunit genes from plant species. Higher amino acid sequence homology (74.04-94.17%) was also noted among AGPase large subunit. The phylogenetic tree for AGPase small subunit also showed close relationship with *Glycine max* and *Phaseolus vulgaris*, while the phylogenetic tree for AGPase large subunit showed close relationship with *Phaseolus vulgaris* and *Glycine max*. The present study focused on isolation, cloning and sequence analysis of two genomic clones encoding small and large AGPase subunits which may have large genetic effects on starch trait in marama. This is the first report of the cloning of genomic clones encoding small and large AGPase subunits from marama. The study elucidates first molecular information about AGPase genes in marama and provides an opportunity for understanding the mechanism of marama starch synthesis.

Damara Orogenic Cycle

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An important part of understanding the geology in any region is the ability to recognise the relative sequence in which the rock units were deposited or intrude, from principles of lateral continuity, superposition and cross-cutting relationships. Once a sequence is established, with the help of geological map, correlations can be made back to the known rocks. Thus, the metasedimentary rocks found in southern portion of the Damara Belt were initially developed as clastic and evaporitic sediments associated with the rifting and break-up of the supercontinent of Rodinia and, ultimately, were allowed in the continental collision and assembly of the supercontinent of Gondwanaland. The tectonic evolution of the Damara orogenic cycle started at about 800-740 Ma with an early rifting stage and attendant rift-basin sedimentation of the Kalahari Craton. It ended at about 450-440 Ma with the last plutonic intrusions and associated

cooling events. In the Nauzerus area, the geology is variable and consists of three main geological components, namely; the Rehoboth Sinclair basement complex, the sedimentary formations of the Nama Group and the Naukluft Nappe Complex. The stratigraphy is that the Sinclair Sequence rocks form the basement on which the younger Damara Sequence is sitting. Given high degree of structural complexity, a wide range of metamorphic changes and degrees of weathering, large expanses of intervening plutonic rocks, and significant original sedimentological variations, geological mapping was required to unveil the stratigraphy of Nauzerus area and as a result, the following lithofacies, from bottom to top are observed: Grauwater Formation, Klein Aub Formation uncomformably by the Kamtsas Formation of the Damara Sequence and on top the Naukluft Nappe Complex.

An analysis of factors affecting full immunization in Namibia

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The main aim of immunization is reduction of mortality and morbidity through vaccinations which must be received in full and on time. My objectives are to study immunization status of children under the age of five, the immunization coverage and timeliness and the factors behind this. The data used is from the NDHS 06/07. This data is to be analyzed using binary logistic regression and survival analysis. It is observed that 94.3% percent of the children were immunized, 73.8% were fully immunized but only 9.4% were fully immunized on time. Even though rural children didn't seem disadvantaged, children with very young, divorced, poor and uneducated mothers have a reduced chance of getting immunized.

KEYWORDS: full immunization coverage and timeliness, socio-economic and demographic factors, binary logistic regression, survival analysis.

Fractional Bromnian Motions-(an application to finance)

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The classical Black and Scholes assert pricing models commonly occurring in finance were derived from the classical Brownian Motions -(Geometry Brownian Motions). It has however been proven in literature that, these type of models do not only fail to better forecast interest rates but equally fail in capturing extreme volatility in asset prices. With advancing technology in todays financial markets, assets are becoming very risky due to the very frequent and extremely unpredictable fluctuations in their prices. These frequent behaviour can not be explained by

integer derivative models. Analysts are therefore challenged to find robust models that could best capture these frequent and rare fluctuations in asset prices. In attending to this call, this research aims at finding robust modifications of classical Brownian Motions by using fractional calculus. In underground water modelling, fractional derivative modified diffusion models have proven to be best in capturing frequent and rare dispersion of particles in comparison to their classical counterparts. This is not unique to underground water modelling, as the dynamics can also be observed in finance. Taking into considerations the desirable properties of the fractional dispersion models, it is ironic that frequent fluctuations in asset prices and interest rate forecasting can equally be modeled using a similar approach. In short the study aims at addressing the issues in using classical Brownian Motions in asset pricing by providing new modified robust models which can be used in pricing asserts, forecasting interest rates and in estimating waiting time distributions.

Phytochemical and antibacterial analysis of indigenous chewing sticks, *Diospyros lycioides* and *Euclea divinorum*

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Diospyros lycioides and *Euclea divinorum* are indigenous to Namibia and belong to the family Ebenaceae. This family is a rich source of naphthoquinones, terpenoids, polyphenols and tannins. The twigs and roots from these plants are commonly used in Namibia as chewing sticks. They are also used to treat various ailments. However, there is limited information on the chemical composition and the antimicrobial activities of these plants. Therefore, the objective of this study was to perform phytochemical and antibacterial analyses of extracts from *D. lycioides* and *E. divinorum* and correlate these to their ethno-medicinal uses. This study focused on the extraction, fractionation and antibacterial testing of crude extracts and fractions.

Plant materials were collected from Caprivi region, ground and tested for presence of secondary metabolites. Exhaustive extraction of the different plant parts with dichloromethane: methanol (1:1) afforded crude extracts which, in the case of the twigs and roots of the two plants, were fractionated using vacuum liquid chromatography. Agar overlay, disc diffusion and agar dilution methods were used to test the antibacterial activity of the extracts and fractions against the oral pathogens, *Streptococcus mutans* and *S. saguinis*. The effect of extracts and fractions on the attachment of oral pathogens to tooth surface was studied using saliva-coated hydroxyapatite beads as a model.

Phytochemical screen tests revealed that both plants possess secondary metabolites namely: anthraquinones, cardenolides, saponins, tannins, polyphenols and terpenoids. The crude root extract of *D. lycioides* yielded the highest zone of growth inhibition with minimum inhibitory concentrations (MICs) of 0.625 mg/mL and 1.25 mg/mL for *S. sanguinis* and *S. mutans*, respectively. For the crude root extract of *E. divinorum* MICs of 1.25 mg/mL and 2.5 mg/mL against the aforementioned organisms, were recorded. The anti-adhesive activity of extracts and fractions for the plants under study, was tested for the first time and the results revealed that the crude extracts from the roots of both plants showed better activity than the twigs and were equipotent in removing bacterial cells attached to the beads. This study showed that *D. lycioides* displayed superior antibacterial activity compared to *E. divinorum*, additionally, the higher activity observed for the roots of *D. lycioides* compared to the twigs supports the traditional use and preference for the roots of the latter as chewing sticks. It further concluded that chewing sticks do not only provide mechanical cleaning but also prevent growth and adhesion of oral microbes on the tooth surface. Further studies are recommended because the selected plants could serve as a potential source of antibacterial compounds

Discrete Time-to-Event Models for age at first sex in Namibia

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Background: There is general call world-wide to promote the delay of first sex and to discourage sex outside of marriage. Early first sexual intercourse is often associated with a number of social problems including unplanned adolescent motherhood, unwanted pregnancies, abortions and infanticide, school drop-outs, maternal mortality, risk of sexually transmitted infections including HI, and a general reduction of future life opportunities for the individual concerned. Data and Methods: This paper fits discrete time- to-event models to retrospective cross-sectional data from the 2006-7 Namibian Health and Demographic Survey, to establish individual and structural effects that impact on the timing of first sex among women. Results / Conclusions: Results indicate that age at first Sex in Namibia is influenced by the womans level of education, age-group, geographical region, religion, socioeconomic status.

Computational Studies of Thermochemical Properties of Phosphabenzene, Diphosphabenzene and Borobenzene Primary Ozonides

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Ozone depletion in the upper atmosphere can cause increased amounts of UV radiation to reach the earth and this can lead to more cases of skin cancer, cataracts and impaired immune systems. UV radiation can also damage sensitive crops, such as soybeans and reduce crop yields. Namibia is part of The Montreal Protocol, an international treaty designed to protect the ozone layer. Research on the interaction of ozone with compounds found in the atmosphere and also in drinking water is important. This project involves the ozonolysis of phosphabenzene, diphosphabenzene and borobenzene using computational techniques. Geometry optimization, frequency and transition state calculations have been done to investigate the structural stability, thermodynamics properties and kinetics of the Primary Ozonides of phosphabenzene, diphosphabenzene and borobenzene. The calculations have been carried out using B3LYP density functional theory in conjunction with the 6-311+G* basis set.

Measurement of refractive index of liquids using modified Singh's method

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There are various techniques available in the literature for the measurement of physical constants. The traditional techniques are not accurate enough and are too expensive. In this paper, we have modified Singh's method to measure the optical constant, the refractive index of liquids instantly.

Linear programming solver

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This System used in this project is specifically called Linear Programming Solver. It generally solves mathematical linear programming problems using the simplex algorithm and the Vogel's approximation algorithm.

In the past years programs of this sort have been developed in such a fashion that they could be used to solve any Linear Programming formulation in which the variables are nonnegative. Some programs could be used as part of the capacity management function to produce aggregate plans for determining the optimal production and employment schedules over the planning horizon. Others could solve problems such as the classical transportation problem in which the objective is to minimize costs between demand and supply points by the use of Linear Programming algorithms.

In this project I have set out to identify any methods currently used in related industries to solve linear programming related problems easily and successfully. From this information, and details on the specifics of popular problems encountered, I have carried through the ideas, incorporating

my own opinions, to formulate suggestions on how this could be done on a wider general level by merging them into one program, while introducing a modified user friendly GUI would provide the user with a wider range of options on how a company desires to go about a Linear Programming problem. For every problem, or potential problem, that arises, a linear programming application can help companies make the best out of their situation.

Computational Studies of Thermochemical Properties and Kinetic of Naphthalene Primary Ozonides

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Ozone reacts with carbon-carbon multiple bonds in compounds such as alkenes via a process called ozonolysis. During ozonolysis, an unstable intermediate called primary ozonide (POZ) is formed and it subsequently rearranges to a more stable secondary ozonide (SOZ). The fact that the primary ozonides are very unstable makes it difficult to obtain their thermodynamic and Kinetics properties through experiments. However, computational approach offers an alternative way of determining the Kinetics and Thermochemical properties of the POZs. This study is an attempt to compute the geometric, thermodynamic and kinetics properties of naphthalene POZs using Density Functional Theory.

On the computation of fundamental group of some topological spaces

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In this talk, we are going to compute the fundamental group of a topological space in term of a decomposition into open subsets. The fundamental group is based on the notion of path homotopies in a space and particularly loops around a given point. Working toward this aim, we are going to show that a specific space admit reasonable decomposition which of course would allow us to utilise the van Kampen Theorem. The van Kampen Theorem allows us to express the fundamental group of a space in terms of the fundamental group of simpler subspaces.

Namibia first Quantiferon TB Gold In-Tube Test for Tuberculosis infection diagnosis in patients

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Introduction: Conventional diagnostic methods in medicine take long for the results to come out and delay the confirmation of clinical diagnosis by laboratory testing. The absence of very rapid diagnostic tool for differential diagnosis of TB in latent and active TB, pose a very big threat to the efforts of combatting TB, as active TB patients can spread infection while waiting for conventional laboratory confirmed results. The human organism's cell immunology response to infection has given the world a QFN TB Gold In-Tube method that shortens the time needed for the diagnosis of TB, especial in country with low TB prevalence, as this new test in the generation of rapid diagnostic test, examine the profile of immune response specific host signature biomarkers for active TB. Using cell immunology concept to assess the usefulness of bio-markers in QFN supernatant plasma diagnosis approach for TB in the Namibia context of high TB, HIV and malnourished prevalence, which affect the immune response to infection and diseases. This research has biotechnology component to monitor the levels of IFN- γ in QFN supernatants of TB patients as a measure of immune response to TB infection and treatment among the Namibian population presenting with respiratory illness at Katutura State hospital in the capital Windhoek.

Methodology: The study population currently includes 84 TB suspects, 18 years and older, HIV negative and positive suspects, living in Windhoek and meeting the AE-TBC patient's requirements inclusion criteria, at the moment of visiting Katutura State Hospital and Katutura Health Centre. The main target number in this whole project is 100 TB suspects, the samples collected goes through the routine medical laboratory testing (AFB Auramine microscopy and Culture) in TB Laboratory at NIP, and cell immunology response test to detect the level of IFN- γ , suspected to be released only in active TB infected individuals. The effect of treatment on the level of IFN- γ in plasma was also monitored in patients at two months and six months after treatment.

Results: A total of 84 suspects was recruited, and tested using a conventional culture method and using the novel rapid Quantiferon test, based on biomarkers. In all recruited patients 21.4% of these were TB positive in microscopy, while 14.3% were TB positive in culture and 53.6% were positive in Quantiferon TB Gold In-Tube. The results shows that the conventional culture and microscopy methods has found only 14.3% TB confirmed by culture, while the novel rapid Quantiferon test based on the biomarkers has detected a high number of TB patients among the suspect.

Short discussion: The use of rapid Quantiferon immune response based diagnosis in Namibia has shown unreliably false positive results in comparison to the TB gold standards diagnostic tool culture laboratory test. This may be to the high TB prevalence in the country and high prevalence of latent TB and HIV infection in the Namibian population. The latent TB infection does not develop in a disease if the person is immuno competent, and this is due to the fact that

the body has an adequate immune response to the incoming pathogen, but he can develop active TB if his or her immune system get compromised. The HIV positive patients have an immuno compromised system and cannot give an adequate biomarker profile to be detected by the quantiferon test.

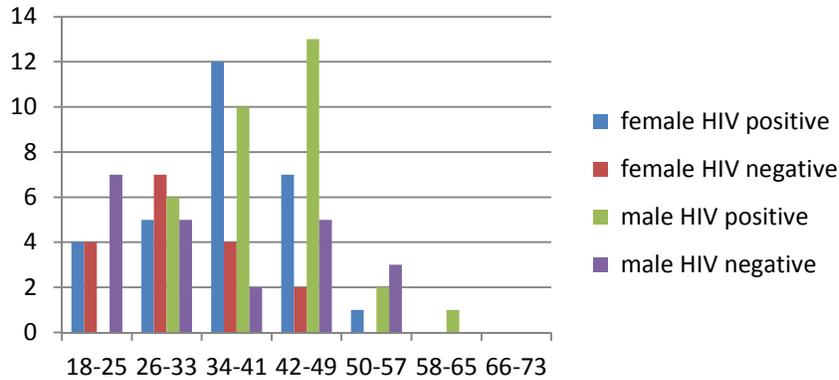


Figure: Participants HIV status and TB test outcomes.

Conclusion: The use of rapid Quantiferon immune response based diagnosis in Namibia has shown unreliably false positive results in comparison to the TB gold standards diagnostic tool culture laboratory test.

Study of natural soil properties and potential of mining waste materials as a habitat for plants during restoration at Sendelingsdrif mine

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Soil refers to the combination of loose weathered minerals, rock materials and decayed organic matter found on the earth surface (Wild, 1993). Mining often disturb ecosystems through the removal of soil and organisms of functional importance. Because mining at Sendelingsdrif will eliminate all topsoil's and endemic plants, a study is put in place to investigate the potential to re-create natural soil properties using different mixes of mine waste materials and enriched versions of these. The main aim of the study is to determine how the physical and chemical properties of post-mining waste materials mixes differ from those of natural soils and how these properties and differences in properties among substrates relate to plant performance. The study took two approaches i.e field work and greenhouse. During fieldwork, environmental data and soil samples were collected from seven habitats that are going to be impacted by mining at Sendelingsdrif. In the greenhouse experiment, different mixes of post-mining waste materials were tested using radish and indigenous plants as bio-indicators of substrate suitability. From the preliminary results obtained so far, it appears that there are differences among waste materials in their ability to support germination, but that enrichment with Lucerne could improve this.

Additionally, some habitats are clearly better than others in supporting plant growth (leading to large differences in plant density between habitats). One variable that seems to have a large effect on density is the aspect of the slope. We suspect that the uneven effect of wind, sun, and rainfall on different aspects could be factors that affect the plants.

Assesment of carbon stock in a bush encroached thornbush savanna at Erichsfelde Shifa, RI.,¹ Shiponeni, N.,² Angombe, ST.³

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Bush encroachment is a form of land degradation that covers about 30 % of Namibia's semiarid surface area. Despite the ecological importance of bushes, several studies outlined negative aspects which undermined the ecological roles. However, the Namibia's Greenhouse Gas report to United Nations Framework Convention on Climate Change (MET, 2008) highlighted that; 'there is little knowledge as to how much carbon is bound in the Namibian bushes and soils in the bush encroached area.' Hence, knowledge gaps on the potential carbon stock storage in the bushes, which can render Namibia a net carbon sink and generate revenues from carbon credits still exist. This study is aimed at quantifying potential carbon stock storage in both non and bush-encroached areas. Further analysis will be done on possible ecological impact of bush encroachment on landscape carbon stock. Both above and belowground carbon stock will be assessed to determine the extend of the effect of bush clearance on landscape carbon stock. The study will be conducted on Erichsfelde farm 40 km north of Okahandja, in Otjozondjupa region, Namibia. Field work will involve soil and standing vegetation biomass sampling whereas; laboratory soil and plant material analyses for carbon stock. A total of five soil pits will be dug in each of the three sites (low, intermediate and high bush encroached) for soil sampling whereas, two 50m line transects will be laid in each of the three sites and five quadrats placed along each line transect for vegetation sampling.

Synthesis and measurement of photo and electronic properties of Nano-ZnO Shikudule, ON. and Wang, J.

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Nano crystalline materials are considered as the challenge of this age. Zinc Oxide (ZnO) of particle size in nanometer range has been paid more attention for their unique properties such as optical, electrical and chemical (Behera 2010). ZnO usually appears as a white powder, nearly

insoluble in water, but it also occurs as a pale yellow powder when it is mixed with other organic materials. The powder is widely used as an additive into numerous materials and products including plastics, ceramics, glass, cement, rubber (e.g. car tyres), lubricants, paints, ointments, adhesives, pigments, foods (source of Zn nutrient), batteries, (Zhiyong and Jia, 2005). As a photo catalyst, ZnO has unique electrical and optical properties that have many important applications, such as for transparent conducting films, waveguides, ultraviolet lasers and solar cells (Lim, 2010). Zinc oxide nanoparticles were synthesized using a simple precipitation method with zinc nitrate and sodium hydroxide as starting materials. The synthesized nano- ZnO sample was prepared at different temperatures 25 °C and 50 °C. The samples were characterized by X-ray diffraction (XRD), IR and UV analysis. Transmittance, conductivity, voltage and resistance were also analyzed. In UV, all the samples have a strong absorption maximum below 420 nm. The IR shows a broad band between 400 and 600 cm⁻¹ , which attributes to the Zn-O stretching mode frequency.

Extraction and antimicrobial activity of essential oils from Namibian aromatic plants

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A wide range of technologies is available for the extraction of active components and essential oils from medical and aromatic plants. The choice depends on the economic feasibility and suitability of the process to the particular situation. Various processes of production of essential oils are reviewed in this study. Essential oils are aromatic and volatile liquids extracted from plants. The chemicals in essential oils are secondary metabolites, which play an important role in plant defence as they often possess antimicrobial properties. Twelve (12) different plant samples were used in this study known by their vernacular names as Rosemary, Onakamuma, Elume-Linyika, Onyanda, Okadhibwabwa, Olukula, Bes01, /Hao-be, /Ho-I, Omweedhe, Omumbumbwa and Lavender. These plant samples were first used to extract Essential Oils (EOs) then analysed for any compounds contained in each plant sample respectively using Thin Layer Chromatography (TLC) method in their diluted and concentrated forms and testing of their antimicrobial activity against *Bacillus cereus*, *Staphylococcus*, *Escherichia coli* and *Candida albican* at levels of 10⁵ -10⁶ ml⁻¹. Gram- negative organisms are slightly less susceptible than gram-positive bacteria. A number of EOs comprises a large number of components and it is likely that their mode of action involves several targets in the bacterial cell.

Physical conditions that improve the action of EOs are low pH, low temperature and low oxygen levels. The aim of this study is to extract EOs from above mentioned plant samples and to evaluate disk diffusion methods for determining the antimicrobial activity of plant extracts and their mixtures. The disk diffusion method was appropriate on as a preliminary screening test

prior to quantitative Minimum Inhibitory Concentrations (MIC) determination with dilution methods.

Synthesis, characterization and applications of various amides based cation chemosensors
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Chemo sensors also known as the Chemo receptors, are the sensory receptors that convert chemical properties into action potentials. Chemo sensors function on a molecular level by generating a signal upon binding (Bull.KoreanChem.Soc, 2006). The signals are due to the detection of certain chemical stimuli on the reaction environment by the chemoreceptor. The field of chemo sensing is experiencing a rapid growth in the recent years. A large part of this is driven by the need in the fields of medical diagnostics, environmental monitoring, toxicological analysis and the need to develop probes that allow for the in-depth understanding of the relationships between the presence of chemical or biological marker and its biological implications. Therefore, in this research, various new chromogenic receptors containing electron-withdrawing groups appended to the amides, ketones and aldehydes were synthesized, and their chromogenic behavior toward various cations are still under investigations. These chemo sensors show visual changes towards biologically relevant cations such as Fe^{2+} .

How can a mobile technology be able to facilitate the upload / download of students' documents for admission processing?

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This research project aims to introduce automated student's academic applications using mobile devices. Current systems are only using hardware such as servers, desktops and laptops but not mobile devices. The number of students joining undergraduate studies is increasing fast through most universities. Manual applications results in crowding a huge number of students inside the administration block as the applicants submits hardcopy of filled application form to the University of Namibia. Office staff enters all data into the system which is prone errors. In this research, UNAM Academic Mobile Applications (UAMA) will eliminate the manual intervention and increase the speed of whole process. It would enable the students to apply to the University of Namibia using their mobile devices. The system will allow a student to fill the form online, system has inbuilt validation system to validate the entered data. The students can login into the system and see their application status after applying. UAMA system will then show the result after instantly and stored the results for further use.

Radiometric and structural mapping at Hollands dome

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The Erongo region is an anomalous uranium province which hosts a number of uranium prospects and operating mines such as Rossing Uranium and Langer Heinrich. The Hollands dome area lies within the Erongo region of Namibia, close to the confluence of the Khan and Swakop rivers. The Hollands dome is a primary uranium mineralization prospect where exploration is currently taking place. The area lies within EPL 3439, owned by Swakop Uranium Private Limited. Uranium deposits at Hollands dome are hosted by networks of leucogranite dykes crosscutting lithostratigraphic units of the Damara sequence that shows a strong spatial relationship between uraniumiferous leucogranite and iron sulphide rich schist containing pyrite, pyrrhotite, chalcopyrite and lesser bornite and molybdenite situated between the Khan and the Rossing formation. The marble played a mechanically important role by inhibiting magma migration leading to ponding and increasing the degree of fluid-wall rock interaction. The schist with high quantities of ferric iron and reduced sulphides (pyrite, pyrrhotite and chalcopyrite) acted as an effective chemical trap for uranium transported in magmatic fluids. These leucogranite melts were structurally controlled in the sense that they followed zones of weakness (faults) when they were emplaced on the surface. As a result vast uranium mineralization is hosted in the calc-silicates bordering the Khan and Rossing formations.

Laser applications in medicine

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A laser delivers a very precise rupture of energy which is very useful in medicine because of unique properties. Laser light is highly monochromatic, coherent and collimated. This article discusses the application of laser in medicines in detail and its scope in Namibia.

Depositional facies and petrography of the upper Dwyka black shales, Ganigobis shale member in southern Namibia

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Ganigobis Shale Member is situated in Karas region, southern Namibia. Thin pyroclastic marker beds are preserved in argillaceous units of the Dwyka Group in Southern Namibia and South Africa which are the earliest witnesses of volcanism in Karoo equivalent strata of southern Africa. The aim of this study is to document the lithostratigraphy of the Ganigobis Shale Member of exposed rocks, present the field appearance of these marker beds, to characterise their mineralogy, geochemistry and heavy mineral contents, Refine the model of organic matter accumulation and decide for one which is more reliable. Various models have been discussed in the literature to explain the depositional environment of the Ganigobis Shale Member, however none of the model is decided for. This means no single model on deposition finally concluded yet and this is still a controversy discussed in the literature. Carboniferous-Permian Karoo deposits in the Aranos Basin of southern Namibia include the glacially dominated, Carboniferous Dwyka Group and the shelf sediments of the overlying Permian Ecca Group totalling approximately 400 m in sediment thickness. The Dwyka Group can be subdivided into four upward-fining deglaciation sequences, each capped by relatively fine-grained glaciolacustrine or glaciomarine deposits. The uppermost part of the second deglaciation sequence comprises a thick fossiliferous mudstone unit, referred to as the "Ganigobis Shale Member".

Evaluation of the payment processing system: integrating and enhancing service delivery process in the Namibian public service

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The study evaluates the payment processing system (PPS) in the Namibian Public Service (NPS), in particular implementation of integrated payment processing system that will enhance service delivery. It is important to review the payment processing system in order to ensure that the integrated system will be a step forward and that it actually produces desired results. However, the challenges faced by the NPS are attributed by manual payments and inadequacy of information to the general ledger. This study aims to integrate the PPS in the NPS to enhance service delivery. The primary method used in this study was questionnaires and semi-structured interviews with the staff members within the Finance Division of Offices/Ministries/Agencies (O/M/A's) and Information Technology (IT) staff members from the Ministry of Finance. The study will be beneficial to the whole Namibian Government, as it will improve the accounting system for reconciliation by eliminating manual processing of payments in both modules. In conclusion, a strategy to integrate modules was recommended in order to allow flow of information on payments and for data to be automatically posted to the accounting system (General ledger) which will improve the analysis on financial statements and automated reconciliation process.

Amayi

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Amayi is inspired by the virus that has become prominent mostly on the UNAM Computer network known popularly known as the RECYCLER virus. The recycler virus exploits the autorun feature in removable devices and uses it to run scripts that can affect the users' data. The virus then makes all folders in the removable drive hidden and creates shortcut files of every folder which when clicked lead to the virus replicating to other storage devices whether permanent or removable, such as internal and external hard drives and other USB devices. This program solves the problem by checking if the windows process that viruses use to execute is running if this process is running it is stopped, the program then searches the registry and if the settings that disable running of scripts exist, if not they are created, then running of scripts is disabled meaning the script-based viruses can no longer run. The program then searches all the files in the removable disk to for the above mentioned effects and reverses the process, and deletes the shortcuts created. This prevents future attack from the same virus or other script-based viruses. What makes Amayi special is that it was designed and developed locally and tested on the local computer network, but it can also be used used on other networks.

Teaching, Education, Engineering, Science, and Technology (TEEST)

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Teaching, education, engineering, science, and technology (TEEST) are the main mandibles for social and economic development of a society. The destructive use of TEEST needs to be checked to have impeccable progress of a society. If the most basic facilities are made available in line with Live, Work, and Care (LWC) for others, the constructive use of TEEST will certainly upsurge the living standard of common people and for this, teaching and scientific institutions should be the real stakeholders of deprived communities. This talk reveals how TEEST can inspire the minds.

The phytochemical and chemical composition of Namibian medicinal resurrection plant

Myrothamnus flabellifolius

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The aim of this research is to determine the phytochemical and chemical composition of the Namibian medicinal resurrection plant *Myrothamnus flabellifolius* which is traditionally used in the management and treatment of various diseases. Samples were collected from Remhoogte, 40 km south from Rehoboth, Namibia. Three different types of solvents were used namely; ethanol, methanol and water on two different plant parts; leaves and twigs. Fourteen different classes of phytochemicals were tested. Flavonoids, steroids, terpenoids, triterpenes, cardiac glycosides, saponins, phlobatannins, tannins and polyphenols were observed in ethanol, methanol and water extracts. However, anthraquinones, iridoids, anthacyanins, leucoanthocyanins and anthranoids were not observed in all three solvent extracts from both the leaves and twigs. These phytochemical constituents were detected by the colour changes based methods. Further phytochemical and chemical components to be tested for are; alkaloids, reducing sugar and amino acids. The quantitative analysis namely; the Total Phenolic Content (TPC) and Total Flavonoid (TF) of the solvent extracts from this resurrectant/medicinal still to be determined.

Genome analysis by Next Generation Sequencing and Schiff's staining in marama bean [*Tylosema esculentum* (Burchell) Schreiber], an orphan legume crop of Southern Africa
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T. esculentum can be considered a genomic 'orphan' species with very few genomic resources available. Marama bean belongs to the family Fabacea and is a candidate for domestication in arid zones. It is indigenous to the Kalahari region thriving in low nutrient and low moisture soils. *T. esculentum* exhibits high oil and protein content comparable to peanut and soybean respectively. The chromosome number and the amount of cell space it takes up is one measure of the amount of genetic material in a cell. To determine the chromosome number, the Schiff's or Feulgen staining technique was used together with oil immersion microscopy under the 100X objective to obtain images from which chromosome counts could be made. The chromosome number and general size of chromosomes in marama bean were determined and compared with those in garden pea. Chromosomes in marama were found to be more numerous than in garden pea though smaller in size. In *Tylosema esculentum* the chromosome number was found to be $n=22$ ($2n=44$) and in *Pisum sativum* it was the expected $n=7$ ($2n=14$). It is postulated that the

genome size of marama is smaller than that of common pea since the cell space occupied by the 44 chromosomes is less than the 14 in garden pea. Genome wide next generation sequencing is underway to investigate this suggestion about the genome size of marama bean. New DNA sequencing technologies provide an opportunity to develop high quality molecular markers for such orphan species. The marama shotgun sequence data was determined and is available with two files of about 117 million reads, each read being 100 bp. There are approximately 22 billion base pairs of sequence to assemble. If the marama genome is around about 1Gb then a 22X sequence of it has been found. The assembler program SAOP de novo is being used to put the data through it. The genome sequencing information is also currently being used to build the complete chloroplast genome of marama. The Blast against the Medicago chloroplast genome revealed many matches and the gaps are being determined.

The use of Loop-mediated isothermal amplification (LAMP) and Polymerase chain reaction (PCR) as quality assurance tools for malaria diagnosis using Rapid Diagnostics Tests (RDT) in Northern Namibia

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Background

Currently Rapid diagnostic tests (RDTs) are routinely used by healthcare workers in Namibia. They are cheap malaria diagnostic tools that give results under half an hour. RDTs are suitable for field use as they are easy to carry (small cassette) and do not require electricity. However, case management reports have indicated that malaria cases sometimes go undetected using RDTs due to RDTs not working under clinical conditions, inaccurate use, poor storage conditions and failure to detect low level parasitaemia. The disadvantages that come with RDTs call for quality control of the RDTs. Failure to get rapid and accurate results could result in perpetual spread of malaria. There is a need for more sensitive and specific tools in conjunction with RDTs will ensure that all cases are identified. . PCR, though sensitive and specific, is not routinely used because of cost implications, long turn-around time for results, and the need for highly skilled personnel. LAMP is a relatively new molecular diagnostic tool for malaria with all the advantages of PCR (sensitive and specific) without the disadvantages (cost, skilled personnel, slow). However, it has not been evaluated extensively as a point of care diagnostic in the field.

Methods

One hundred and fifteen used RDTs were collected from health facilities in Northern Namibia in a blind study, DNA was extracted from the RDTs using the Chelex method. The isolated DNA

was used for PCR and LAMP to determine the presence of *Plasmodium* DNA Pan- *Plasmodium* primers for the assay.

Results and Conclusion

DNA was successfully isolated from RDTs. PCR and LAMP analysis of all samples indicated false negatives due to low parasitaemia. Out of a total of one hundred and fifteen RDTs, ten were positive. A total of sixteen samples were positive by PCR and twenty-two were positive by LAMP. Of the three techniques, LAMP was the most sensitive. In a low transmission setting like Namibia, it is necessary to detect all sources of malaria including sub-patent infections in order to eliminate malaria. Therefore it is necessary to have quality assurance of RDTs.

Synthesis & characteristics of isatin-(Ra)-thiosemicarbazone with various metal complexes

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The emergence of clinically significant multidrug-resistance diseases such as Malaria due to the capability of disease-causing microorganisms to mutate and become resistant to currently available drugs has prompted the research of new drugs or appropriate modification of these currently available drugs to produce more effective drugs. Thiocarbazones and their derivatives are currently receiving more attention in medicinal research work because they are known to possess a wide variety of chemotherapeutic properties such as, antitumor, anticancer, antiprotozoal, antibacterial or antiviral activities. Schiff bases of isatin are investigated for their pharmaceutical properties. Thus isatin is a biologically validated starting point for the design and synthesis of metal complexes. Thiosemicarbazones and their metal complexes are compounds that possess antitumor, antibacterial, antifungal and antiviral properties. The biological activities for the Thiocarbazones were enhanced by adding the special group (Ra). For the most majority of cases the activity of the ligand is greatly enhanced by the presence of a metal ion. Thus the three metal-ligand complexes were synthesized from the initially prepared ligands of Isatin and an (Ra)-thiocarbazide.

The synthesis and characterization of ruthenium-based dye sensitizer solar cells and their applications in photocatalytic H₂ production from H₂O

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A dinuclear ruthenium(II) dye sensitizer, ([Ru₂(bpy)₄BL](ClO₄)₂) referred as Compound 1, where bpy = 2,2'-bipyridine, BL = 2,2'-((1E,1'E)-((E)-diazene-1,2-diyl-bis(2,1-phenylene))-

bis(azanylylidene))-bis (methanylylidene)) diphenol (a bidentate bridging ligand), was designed, synthesized and characterized. The dye sensitizer was used on the photocatalytic water splitting for hydrogen (H₂) production over TiO₂ (P25) under visible light ($\lambda \geq 400$ nm) irradiation using triethanolamine (TEOA) as a sacrificial electron donor. The dye sensitized-TiO₂ demonstrated a good stability and sufficient reproducibility for over 6 h. The photosensitization ability of the sensitizer was due to its conjugation system, large molecular area, TiO₂ linkage mode and the antenna effect.

Cyber security risk management and threat control (CSRM-TC): enhancing the protection of information in the Namibian public service

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Technology is advancing and demand for content has grown to an extent that consumers requires access to information while on the go. With the current technology trends, Internet has become the main platform for information exchange. It has become a platform where business is conducted, a main channel where communication is done and a main repository for information worldwide. Internet is a huge network of networks that is not owned by anyone and alot is happening within it. As organisation gain access to the Internet they become part of the huge network of networks. In this network intruders can gain access to the organisations information systems and tamper with data if proper security measures are not put in place. Criminal activities committed through the internet are referred to as cybercrime. The study focused at ways on how cyber security risks can be identified and addressed in the Namibian public service to ensure that data confidentiality, integrity and availability is maintained and information is protected against cyber criminals. During the study existing cyber security frameworks were compared and a suitable framework that fits the Namibian Public Service environment was developed. The findings of the study has revealed that technology alone cannot defeat cybercrime but a collaborative effort that comprises of the legal infrastructure, user education and training, change management, specialized security skills and dedicated security equipment is required to address the challenges.

Synthesis and characterization of metal complexes containing thio ligand derived from acetophenone

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Malaria is a life threatening disease which may be fatal if not treated timeously. Due to increasing drug resistance there is a need to developing more drug and modified drugs with potential impact on parasites. These serve as an indication of the potential for new drug discovery. There is also a need for an attempt to find a relationship between common structural features and activity. Thus has prompted us to undertake research in this area. Thiosemicarbazone ligand and six metal complexes of : Cu(II) ,Zn(II) ,Ni(II) ,Mn(II) ,Fe(II) ,Cr(II) derived from acetophenone has been synthesized. The interaction of these donors ligand (NS bidentate donors) and metal ions give complexes of different geometries and these complexes are potentially biologically active. The presence of a metal ion almost systematically increases the activity or contributes to mitigate the side effects of the organic parent compounds.

***Stenotrophomonas* sp, a marama associated endophyte with plant growth promoter potentials**

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Endophytic bacteria colonize the inner host tissue without injuring the host or provoking strong defense response. They offer a massive potential for defense and increased plants' agronomic performance. Currently, endophytes are viewed as a new source of genes, proteins and biochemical compounds that may be used to improve industrial processes. In a study investigating the community of endophytic diazotroph associated with *Tylosema esculentum*, a Gram-negative, rod shaped non-spore forming and nitrogen fixing bacteria was isolated from a surface sterilized tuber. Using 16S rRNA gene sequence analysis, it was revealed that the strain belongs to the genus *Stenotrophomonas* and was most closely related to *Stenotrophomonas maltophilia*. These bacteria are endowed with numerous plant growth promotion qualities such phosphate solubilisation, the production of Indole Acetic Acid (IAA) and siderophore mediated iron that may provide an inexpensive advantage to the host with respect to pathogen inhibition, or by establishing plant's systemic resistance. Its culture filtrate has shown some antibacterial activity against some common bacterial pathogens. These findings suggest that *Stenotrophomonas* strains can be used as bioinoculant to enhance growth. In addition, this species that may fix nitrogen in symbiosis with Marama is especially interesting for this plant grows in areas known to grow on soils with low nutrient. The existence of bacteria capable of influencing the nutrient uptake may have a beneficial role in the establishment, growth and survival of Marama bean. To the best of our knowledge, this work presents the first report of marama endophyte.

Identification of toxins from indigenous plants which are responsible for the loss of livestock in Namibia

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One cannot over-estimate the importance of the impact of poisonous plants on the livestock industry in Namibia. Animals are often kept under extensive conditions and overstocking, droughts and veld fires force animals to feed on poisonous plants which would otherwise be avoided. Under these conditions, devastating outbreaks of poisoning have been reported and livestock losses due to ingestion of poisonous plants have become a concern. Through this study it is aimed to identify toxins responsible for causing loss of livestock specifically in Namibia due to the ingestion of indigenous plants. These findings should contribute to the knowledge of these plants and the mechanism of action by which poisoning takes place. This will be used to find new ways of treating affected animals and ultimately reducing stock losses. The methodology for the study includes fractionation of plant material into polar and non-polar crude fractions, which will be followed by the isolation of the individual constituents by high resolution HPLC fractionation strategies. Pure compounds will be submitted to toxicity assays. Those that display significant toxicity will be analysed using mass spectrometry and nuclear magnetic resonance spectroscopy, in order to elucidate their molecular structures. This information may be used in future to determine the mechanism of action of these toxins in animals.

**Isolation and HPLC analysis of “drug like” compounds of the Wild Everlasting,
*Helichrysum agyrosphaerum***

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Many *Helichrysum* plant species have been used traditionally for their medicinal properties. In addition, *Helichrysum agyrosphaerum* cause blindness to stock animals, mainly in sheep, when ingested in large quantities. This plant species is common in Southern Africa, but toxicosis has been restricted to Namibia and the toxic principle is still unknown. Liquid-liquid extraction (sequential extractions in order of polarity: hexane, dichloromethane and methanol) followed by solid-phase extraction procedures were performed on different parts of the plant (flowers, stems and leaves). The solid-phase extraction procedure used, ensured the selective isolation of “drug-like” compounds from the plant extracts based on their hydrophobicity (log P values). The solid-phase extraction cartridge will retain constituents with log P > 5 and elute constituents that has log P < 5. These extracts were analysed by reversed-phase HPLC and chromatographic peaks corresponding to all the compounds with log P < 5 could be observed. Constituents with log P < 5 is considered to be “drug like” because of their favourable physico-chemical properties and is

considered to be the compounds that will be the only “drugable” constituents of this plant. Individual “drug-like” compounds were purified by semi-preparative HPLC.

Trace metal pollution of central Namibian marine shoreline using *Choromytilus meridionalis* (black mussel) species as indicator organism

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This study was carried out at four stations along the central Namibian marine coastline towns (Walvis Bay, Swakopmund, Henties Bay and Cape Cross) to assess trace metals pollution using *Choromytilus meridionalis* as indicator organism. Samples were collected using randomized sampling techniques during winter and summer months of 2012. EPA 3050B and ICP-OES protocols were used to digest and assimilate the samples. Metal levels in mussels and sediments ranked in the order: Fe > Zn > Cu > Pb. All metal values recorded were lower or within those reported elsewhere. Walvis Bay recorded increased metal levels ($P < 0.05$) than other stations probably due to factors like port activities e.g. ship repairs, urban and residential settlements, tourism and recreation as well as run-off water from catchment areas. Sediments exhibited significantly higher mean trace metals than mussels and water ($P < 0.05$). In addition, no metal correlations were observed in mussels while a clear-cut significant correlation was exhibited in sediment and water samples. Maximum Fe, Zn, Cu, and Pb mean values in mussels were 483.7, 79.3, 6.5, and 2.3 mg/Kg of sample dry weight respectively while maximum Fe, Zn, Pb, and Cu values in sediments were 44, 749.9, 100.0, 79.3 and 50.5 mg/Kg of sample dry weight respectively. Only Cu and Pb in mussels recorded significant differences while Zn and Fe mean values were significant in sediments between the seasons compared to water samples in which all were significant ($P < 0.05$). Cu levels in water exceed the safe limit (0.01mg/L) though Pb levels in mussels do not exceed the safe limit of 1 mg/Kg (EC. No.466/2001). Hence, mussels could be regarded safe for consumption than water but increased metal levels should pose health concerns; and stress the need for continued monitoring of these metals to avoid human risks and irreversible/costly effects.

Dense wavelength division multiplexing (DWDM) optical communication system

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This paper deals with the twin concept of optical networking and dense wavelength division multiplexing (DWDM) optical network system. The paper talks about various components of

dense wavelength division multiplexing system, important DWDM optical networking concepts like wavelength routing, wavelength conversion, signal amplification, transmission of data by laser light and DWDM system performance issues such as various crosstalk due to DWDM demultiplexer and multiplexers, dispersion, attenuation, noise and loss of signal are discussed in details. Finally it discusses the future direction of research in DWDM system.

The influence of humans and their livestock on the movement and habitat choice of Grevy's Zebras (*Equus grevyi*) in the Samburu Westgate Conservancies in northern Kenya
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After a population decline of 85%, today only an estimate of 2 400 (KNGZTF, 2007) Grevy's zebra (*Equus grevyi*) remain in Kenya and Ethiopia. More than 60% of the Grevy's zebra in Northern Kenya are located on community land, where pastoralists graze their livestock. Competition for fodder between livestock and wildlife can occur. Both are important sources of income through revenues from pastoralism and tourism. Successful coexistence is vital for the people's livelihood and the survival of *Equus grevyi*. The aim of this study is to contribute a new level of detail to understanding the influences and threats to the endangered Grevy's zebras by asking questions concerning livestock avoidance, habitat preferences and settlement avoidance of Grevy's zebra and how vegetation changes in relation to settlements. GIS (Geographic Information Systems) maps will be produced, illustrating the movement and distribution of *Equus grevyi*. It is hypothesized that it will be possible to quantify a trade-off between choice of optimal forage areas and evasion of humans, their settlements and livestock herds by Grevy's zebra. However it is assumed that vegetation suitability will have a higher impact on habitat choice than livestock movement. Movement of ten female Grevy's zebra will be tracked continuously using GPS (Global Positioning System) radio collars in the study area. In addition lead animals of livestock herds will be tracked with GPS loggers. Vegetation assessments will be made. Grevy's zebras' home ranges will be computed. Relationships between Grevy's zebra distribution and livestock grazing orbits and vegetation quality and habitat choice will be analyzed. Random movement models will be applied to determine livestock avoidance.

Examining student's knowledge of prevention of mother to child transmission (PMTCT) at UNAM as one of the HIV/AIDS preventive measures

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HIV and AIDS in Namibia has spared no community, institution, household and individual around, you are either infected or affected by the HIV virus(NHS 2006-2007). The aim of this study is to examine student's knowledge, attitude and concerns towards prevention of mother to child transmission. The findings of this study will be beneficial to the University of Namibia, Ministry of Health and Social Services and other stakeholders involved in HIV prevention as well as other advocates of PMTCT to make informative decision. It is hoped that by doing so, the study will contribute to the existing body of knowledge. The study also aims to examine whether demographic factors influence students knowledge of PMTCT using Logistic Regression. The results show gender as one of the factors influencing the knowledge of PMTCT among students.

International Science and Technology Journal of Namibia



Aims and Scope

The journal reflects the multidisciplinary nature of the field of science and technology. It addresses the needs of multiple, interlocking communities, including methodologists in mathematics, statistics and econometrics; as well as basic and applied scientists in biology, public health, medicine, education, mining, geology, computing, food, agriculture and engineering. The journal will strive to enhance the level of methodological rigour in pure and applied sciences and will contribute to the development of methodological standards in the fields of science and technology in Namibia. In pursuing its main objective, the journal will also provide a meeting ground for researchers from a number of traditional disciplines and will foster the development of scientific research and publication especially among younger practitioners.

ISTJN will publish:

- Original Research papers;
- Invited papers- with discussion and rejoinder;
- Case Studies setting out substantial applications of scientific methodology;
- Review Articles, synthesizing and popularizing methodological developments;
- Tutorials;
- Book reviews and notices;
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