

## Recipients of the 2014 Canada-Africa Research Exchange Grants (CAREG)

*The summaries below are presented in the language of the applicants' submissions to the CAREG competitions.*

### Cameroon

#### **Quantifying the impact of forest management practices on carbon storage in forest ecosystems in Africa: Implications for the development of REDD+ initiatives in the Congo Basin**

*Neal Scott, Queen's University, Canada*

*Adrien Djomo, Queen's University, Canada*

*Louis Zapfack, the University of Yaoundé 1, Cameroon*

Canada and Cameroon are two countries with extensive forest resources. While logging may benefit forest owners, it also contributes to rising carbon dioxide levels in the atmosphere. While forest preservation in tropical regions (e.g. REDD+ initiatives) is critical to reduce the impact of harvesting on the global carbon budget, improved forest management practices might provide opportunities to provide forest products AND sequester carbon from the atmosphere. Forests of central Africa contribute significantly to the global carbon budget. However, quantifying the contribution of these forests to the global carbon budget is difficult because key allometric equations to estimate forest biomass are lacking. These models are needed to estimate current carbon stocks as well as for modeling the impact of forest management practices on the carbon cycle. These models can also be used to evaluate the impact of different management regimes on whole-ecosystem carbon storage in Ontario. We propose to develop 1) allometric models to estimate above- and belowground biomass from moist forest ecosystems in Cameroon, including buttress trees, large trees, and lianas, and 2) a stand-level carbon budget model to quantify non-tree carbon stocks and changes in whole-system carbon stocks due to forest management. This research partnership comes at the time UN REDD in Congo Basin is trying to quantify the contribution of biomass conservation to climate change. In this joint research activity, researchers from Queen's University and University of Yaoundé I will collaborate on the development of these equations and models that will be used to assess the impact of forest management on the carbon cycle – these models are needed in both countries. We believe that this partnership will also provide basis for technology transfer and establish a training program aiming at positioning Canada and Cameroon as leaders in ecological management of forest resources.

### Côte d'Ivoire

#### **Le processus d'adoption et d'intégration des TIC dans les PME ivoiriennes : freins, facteurs d'adoption, sources d'influence, impacts**

*Mario Bourgault, École Polytechnique de Montréal, Canada*

*N'Doli Guillaume Assiélou, Université Nangui Abrogoua, Côte d'Ivoire*

Les technologies de l'information et de la communication (TIC) sont aujourd'hui vitales pour le développement des PME. Cependant, ces dernières ne sont pas toujours outillées pour les adopter et

les intégrer à leurs activités. Ce projet présente l'analyse du processus d'intégration des TIC aux pratiques des PME ivoiriennes. Les objectifs de la recherche seront réalisés grâce à une approche méthodologique mixte, à savoir des entrevues de professionnels de PME pour bâtir et alimenter notre base de connaissances, puis une enquête par questionnaire auprès de PME de différents domaines d'activités (services, commerce, agriculture, etc.). Le projet devra permettre (1) d'identifier les facteurs d'influence du processus d'adoption et d'intégration des TIC, (2) de proposer un modèle d'intégration des TIC, et (3) de formuler des recommandations aussi bien aux dirigeants d'entreprises et les responsables politiques pour les aider à élaborer une politique d'adoption et d'intégration des TIC.

### **Étude d'extraits végétaux pour application comme passivateurs naturel d'huile de transformateur de puissance**

*Issouf Fofana, Université du Québec à Chicoutimi, Canada*

*Betie Amidou, Université du Québec à Chicoutimi, Canada*

*Sorbo Siaka, Institut National Polytechnique Félix Houphouët-Boigny, Côte D'Ivoire*

*Yaya Sorbo, Institut National Polytechnique Félix Houphouët-Boigny, Côte D'Ivoire*

*Zié Yeo, Institut National Polytechnique Félix Houphouët-Boigny, Côte D'Ivoire*

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Les transformateurs de puissance sont considérés comme des investissements capitaux dans l'infrastructure de chaque pays, notamment pour les pays en voie de développement. Ils représentent le « cœur » de tout réseau de transport et distribution d'énergie électrique. Il est donc essentiel qu'ils fonctionnent correctement. La dégradation du système isolant (huile-papier) qui constitue le talon d'Achille du transformateur, est, principalement accélérée par le champ électrique, la température, l'oxygène et l'humidité. Comme conséquence, la détérioration du papier d'entre les enroulements conduit à des court-circuits ayant pour résultat la panne du transformateur. Les conséquences d'une panne de transformateurs se chiffrent généralement en termes de milliards de dollars. Le 1, 2, inhibiteur de corrosion 3-Benzotriazole : BTA, qui affecte négativement les propriétés de l'huile, est ajoutée à l'huile en très faible quantité en vue de retarder les processus d'oxydation et de prolonger la durée de vie de ces équipements capitaux.

Depuis ces dernières années, les problèmes environnementaux liés aux produits de synthèse ont impulsé une nouvelle dynamique à la recherche de composés biodégradables respectueux de l'environnement. Dans des récents travaux effectués au sein de notre laboratoire, nous avons observé l'inhibition de corrosion de pièces en acier doux à l'aide d'extraits végétaux. Il s'agit dans ce présent projet de recherche d'étendre cette expertise par la recherche d'inhibiteurs biodégradables applicables aux huiles de transformateurs de puissance ainsi qu'à la protection des réservoirs de ces derniers. De façon spécifique, il s'agira de mettre en évidence la ou les composés responsables de ces actions inhibitrices dans le but d'établir leur structure et de comprendre les mécanismes d'actions. La mise au point en définitif de bioproduits capables de jouer ces rôles dans les transformateurs sans affecter les propriétés diélectriques et thermiques contribuerait à renforcer la qualité de ces équipements d'importance capitale et de garantir la distribution d'électricité aux utilisateurs.

## **Ghana**

### **Saving the brains of unborn children: Understanding the prevalence of Fetal Alcohol Spectrum Disorder (FASD) in Ghana**

*Michael Baffoe, University of Manitoba, Canada*

*Don Fuchs, University of Manitoba, Canada*

*Mavis Dako-Gyeke, University of Ghana*

In Ghana, there is evidence of increased alcohol consumption among women during pregnancy (Culley et.al, 2013; Popova, 2013). This has raised concerns about the need to focus attention on the serious risks associated with the drinking habits of women of child-bearing age, and most importantly women who drink during pregnancy. Researchers from the Faculty of Social Work, University of Manitoba and the Department of Social Work, University of Ghana, propose to conduct a study in selected rural and urban communities in Ghana to investigate the beliefs, perceptions and knowledge about the causes of FASD and the effects of alcohol consumption during pregnancy. The results from this research will assist in developing approaches to effectively address the prevention and interventions with children, parents and communities with the high rates of FASD (May, 2011; Popova, 2011). The output from this study will be the production of two comprehensive reports with policy recommendations to the Ministries of Health, Women, Children and Social protection to address the prevention of alcohol consumption during pregnancy. The second output will be a proposed strategy for government and non-government organizations to address prevention and intervention with women and children with FASD. Moreover, this study will provide a timely follow-up to and build on a project that was launched in Ghana in June 2013 by the Faculty of Social Work, University of Manitoba and the Ghana Organization on Fetal Alcohol Syndrome (GOFAS) to create a national awareness on the prevalence of FASD and improved policy on the prevention of alcohol consumption among pregnant and women of child bearing age.

### **Gender, health and place: A multi-site ethnography of women's experience and perceptions of health**

*Helen Vallianatos, University of Alberta, Canada*

*Magdalena Sophia Richter, University of Alberta, Canada*

*Kwasi Ansu-Kyeremeh, University of Ghana*

This project emerged out of one community's concerns around maternal health in Ghana. To address maternal health, a better understanding is needed of how people in general, and women themselves, conceptualize health and their bodies. It is important to not assume that all people within or across cultures share the same understandings of health, what it means to be healthy, and practices for maintaining health. To begin to systematically document such cultural complexities, we propose to examine how women in one village in Ghana understand health and how this shapes their health behaviours for their own self-care, and secondarily, that of their children's wellness. We recognize that a local milieu influences health beliefs and practices, consequently, we will also investigate how women who have migrated to Accra conceptualize health and how this affects their self-care and that of their children. When investigating women's ideas on child health and their child health practices, we will document whether (or how) gender of the child shapes their ideas and practices. To contextualize women's health beliefs and practices in both places, we will collect and analyze Ghanaian national and local health messaging. Thus, by conducting research in two sites

(multi-site ethnography), one in a village with women who live near their natal area, and another in a city with women who have migrated from other regions, we will have the data to examine how place and culture intersect and shape health beliefs and practices. In our analysis of place, we will consider social, political, economic and physical aspects of the local milieu. We will involve both Ghanaian and Canadian students in the research process, training new scholars and hopefully providing the seeds of future global collaborations.

### **Housing and health needs among HIV positive persons in Agomanya, Ghana**

*Eric Y. Tenkorang, Memorial University, Canada*

*Yaa A. Omusu, University of Ghana, Ghana*

Although emerging in western industrialized societies, research on the housing needs of vulnerable populations such as those living with HIV/AIDS has received less attention from scholars and policy makers in sub-Saharan Africa. This is unfortunate, especially when the majority of people living with HIV reside in sub-Saharan Africa, and governments in these parts of the world are the worst violators of housing rights. With very weak and unstable economies in several parts of sub-Saharan Africa, including Ghana, persons living with HIV/AIDS are particularly financially vulnerable, but this vulnerability is heightened given that they sometimes feel too sick to work and cannot afford decent housing. Also, with high levels of stigma in Ghana, persons living with HIV/AIDS are more likely to face tenure insecurity and evictions, and homelessness among HIV positive persons could potentially expose them to behaviors that may lead to re-infection or onward transmission of the virus to others. Furthermore, with a lowered immune system, living in homes that fail to meet the required housing standards could expose patients to more opportunistic infections and other serious health complications. Notwithstanding, public discourse on the housing needs of HIV positive persons has been lacking in several parts of sub-Saharan Africa including Ghana, which is not surprising given the dearth of research in this area. Using both quantitative and qualitative data collected from Ghana, this project fills an important research gap as it is one of the foremost, if not the only attempt at examining linkages between the housing and health needs of HIV positive persons in sub-Saharan Africa and Ghana specifically. It is expected that the findings of this research will open both academic and policy debates on housing policies for HIV positive persons living in sub-Saharan Africa using Ghana as a case study.

### **Kenya**

#### **Genetic diversity of *Toxoplasma gondii* isolates from chickens, feral and household cats in Thika District, Kenya**

*Lucy Matharia, University of Guelph, Canada*

*Naomi W.N. Maina, Jomo Kenyatta University of Agriculture and Technology, Kenya*

*Simon M. Karanja, Jomo Kenyatta University of Agriculture and Technology, Kenya*

*Toxoplasma gondii* is the causative agent of toxoplasmosis. Humans become infected when they ingest food and water contaminated with oocysts from cat feces, or parasite cysts in raw or undercooked meat. Toxoplasmosis is the most common zoonotic parasitic human disease with the highest parasite burdens reported in low income populations. *T. gondii* infections can have severe consequences. Infections in pregnant women can lead to severe congenital defects of the fetus, and

to death in immune-compromised persons. For these reasons, toxoplasmosis poses a substantial burden of poor health globally.

The few studies conducted in Kenya suggest a high prevalence of chronic human toxoplasmosis indicating widespread exposure to the parasite. Serological screening detected *T. gondii* antibodies in 54% of blood donors from 4 regions of Kenya. The prevalence of antibodies rose from 35% to 60% in preschool and early school-age children, respectively. A study of farmers in Thika District identified as risk factors free-range cats, improper handling and disposal of cat feces and livestock manure, and consumption of untreated water. High risk groups included HIV-positive patients, livestock keepers and slaughterhouse workers.

Thika District is a densely populated rural-urban area renowned for dairy, pig and poultry farming. It has one of the highest prevalence (6.1%) of HIV/AIDS cases in Kenya. No previous studies have investigated the population structure and genotypes of *T. gondii* parasite isolates from cats and free-range chickens. Cats are the only host that can shed oocysts into the environment and as such have a major influence in the epidemiology of toxoplasmosis. Infections in free-range chickens are good indicators of the prevalence of oocysts in soils. Since the transmission and pathogenicity are genetically dependent we propose to genotype the parasites for epidemiological correlation with clinical data.

## **Rwanda**

### **Education and practice in perioperative pain management at two academic medical centres in Rwanda**

*Ana Johnson, Queen's University, Canada*

*Joel Parlow, Queen's University, Canada*

*Ryan Mabaffey, Queen's University, Canada*

*Elizabeth vandenKerkhof, Queen's University, Canada*

*David Goldstein, Queen's University, Canada*

*Rosemary Wilson, Queen's University, Canada*

*Theogene Twagirimugabe, University of Rwanda*

The problem to be addressed is the effective management of acute pain in Rwanda. Relief from pain forms part of a fundamental human right, according to the World Health Organization. Despite a comprehensive educational program in Anesthesiology, including pain management, in place since 2006, very limited adoption of acute pain management strategies has occurred. The proposed research addresses the “Global Health Policy” program area by identifying the needs and barriers among medical and nursing personnel (taking into consideration gender/socio-cultural factors) as it relates to postoperative pain management.

Under-utilization of technologies and resources is common in developing countries. In order to optimally use technologies and allocate resources, it is important to understand and weigh the barriers, risks and benefits to utilization. This research builds on data derived from previous focus group interviews carried out by our group. We plan to conduct surveys and further focus groups, key informant interviews, and interviews with physicians, nurses, residents and policy makers as they

pertain to acute pain management within the local environment in Rwanda (Kigali and Butare). These surveys will also help to determine prioritization processes in place for pain management, and to assess perceived and actual resource availability and allocation. Using the data generated, an implementation strategy for acute pain management protocols will be undertaken, and an evaluation process will be planned for future use.

## **South Africa**

### **International guidelines for fitness-to-drive assessment: A cooperative inquiry mixed methods approach**

*Sherrilene Classen, Western University, Canada*

*Lana Van Niekerk, Stellenbosch University, South Africa*

The World Health Organization indicates that South Africa is leading the work with 33.2 deaths per 100,000 in road traffic fatalities, annually. Although motor vehicle crashes are a prime contributor to road traffic fatalities, driving is a facilitator of independence, autonomy, community participation, and a means for employment in a public-transport and commercial-driving setting. To prevent crashes, driving must be assessed from the perspective of the human visual, cognitive, motor and sensory systems, interacting with the vehicle within a dynamic and unpredictable driving environment. Internationally, the gold standard for assessing fitness-to-drive is the comprehensive driving evaluation (clinical tests and on-road assessment) administered by specially trained medical professionals called driving rehabilitation specialists. Many differences exist in demographics (e.g., health literacy) or driving environments (e.g., roadway infrastructure) between middle-income (e.g., South Africa) and high-income countries (e.g., Canada). Given that existing driving assessments were developed in high-income countries, there is substantial need for contextually relevant and culturally sensitive fitness-to-drive assessments in South Africa. Working as a cross-continental multi-disciplinary team, and building on current knowledge and ongoing research in Canada and elsewhere, combined with new collaborative projects envisioned in South Africa, our team proposes to develop context specific and culturally relevant evidence-based driving assessment tools for use by trained occupational therapists (and others) in South Africa. We also propose to facilitate, with community stakeholders, legislation informing fitness-to-drive assessment practices for at-risk-drivers. In doing so, we will develop for South Africa, the first-ever driving related clinical practice guidelines, evidence-based standards of practice, and minimum criteria for safe driver legislation.

### **Expected changes in domestic water Use in the climate change (CC) context: Case of Southern Africa**

*Musandji Fuamba, École Polytechnique de Montréal, Canada*

*Heinz Jacobs, Stellenbosch University, South Africa*

The proposed research addresses the first IDRC program area, Agriculture and the Environment, more specifically its two CAREG research priorities: (1) Agriculture and Food Security and (2) CC and Water Change. The main objective of this project is to determine expected future changes in domestic water use in southern Africa. The specific objectives are: (1) selection of existing climate change models for predicting surface water resources (SWR) and their uncertainties for the period 2020-2079, (2) selection of models to determine the SWR impact on agriculture for food security, (3) selection of end-use model to determine the SWR impact on household water use, and (4)

application of case studies. The final result will be the development of an action plan to contribute to the better management of available water resources and to securing urban agricultural production. A strategy for gender equality will be clearly explained in the action plan so that the project is able to implement measures to mitigate potentially negative impacts on women. This plan will also help to reduce the factors emerging from diseases linked to water. Training for some local development actors and agents will be organized at the end of the project.

### **The physiology of respiratory chemoreceptors in insects**

*Philip G. D. Matthews, The University of British Columbia, Canada*

*John S. Terblanche, Stellenbosch University, South Africa*

Insects have a profound impact on agriculture, both beneficial (i.e., as pollinators, biological control agents and decomposers) and detrimental (i.e., as pests, parasites or vectors of disease). In order to successfully manage both their positive and negative aspects, it is necessary to have a sound understanding of their physiology. Of immediate importance to every insect is the process of gas exchange. To survive, insects must regulate their breathing to maintain physiologically acceptable levels of oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) within their tissues. Respiratory chemoreceptors provide the sensor and effector by detecting when internal levels of these gases require adjustment and then stimulating ventilation. Although their function is critical, the location of chemoreceptive cells within the insect's nervous system, and how they detect O<sub>2</sub> and CO<sub>2</sub>, remains unknown. This project aims to address this fundamental gap in our understanding by using a range of physiological and histological techniques to localize the chemoreceptors, and to determine how they detect O<sub>2</sub> and CO<sub>2</sub> and how they control gas exchange. The outcomes of such research are critical to a range of fields, including science and innovation and agricultural pest management. They are also of central importance in understanding the responses of terrestrial animals to changing environments. This project will use the desert locust *Schistocerca gregaria*, an important agricultural pest, and silkworm pupae as model species with which to investigate the behavior and function of insect respiratory chemoreceptors.

### **Tanzania**

#### **Innovation exchange: Strengthening evidence based maternal child care in Nova Scotia and Tanzania**

*Megan Aston, Dalhousie University, Canada*

*Thecla W. Kobi, The Muhimbili University of Health and Allied Sciences, Tanzania*

The Tanzanian Government and nurse researchers at the Muhimbili University Health and Allied Services School of Nursing have prioritized maternal and child health as an urgent health care issue. Statistics show that 50% of maternal and neonatal deaths occur within the first 24 hours, and 75% within the first week, and only 31% of mothers come for a health care visit within 48 hours after delivery (Tanzania DHS 2010). Nurse-midwives are trained to provide maternal child care during the pre, ante and post natal periods. Only recently community health workers have been hired by the Ministry of Health to provide community postpartum support, however, nurse-midwives are not part of this support system. Nurse-midwives and nurse researchers are questioning this choice of workforce planning and stress the urgency of examining this issue further. The purpose of this project is to build a research team to examine how postpartum services are organized, delivered and

experienced in Tanzania by nurse-midwives, community health workers and mothers. The CAREG will enable teams in Tanzania and Nova Scotia to build strong partnerships between universities, the WHO collaborating centre, and various health care agencies. We will also be enabled to train each other in different research methodologies, learn about midwifery in both countries, conduct a pilot study and submit a research grant proposal for a larger research study.