IBRO-ARC/ISN NEUROSCIENCE SCHOOL

VENUE

Faculty of Medicine and Biomedical Sciences,

University of Yaounde I–Cameroon

Organizers:

Dr. Carine Nguemeni (University Hospital, Würzburg, Germany)

Prof. Constant Anatole Pieme (University of Yaounde, Cameroon)

Theme of School:	Basic Neuroscience in Small Animals
Date:	23rd-27th July 2018 (Monday to Friday)
Venue:	Faculty of Medicine and Biomedical Sciences
	University of Yaounde I, Yaounde Cameroon
Host:	Prof. Constant Anatole Pieme

Local Organizing Committee

Dr Biapa Nya Prosper Cabral, PhD

Faculty of Sciences, University of Dschang, Cameroon

Dr Moukette M. Bruno, PhD

Biochemistry, Faculty of Sciences; University of Yaoundé I, Cameroon

Dr Fotsing David, PhD

Faculty of Sciences; University of Bamenda, Cameroon

Dr Omam Omam, PhD

University of Ngaoundere, Cameroon

Dr Ama Moor Vicky Joycelyne MD, PhD

Biochemistry, Faculty Medicine and Biomedical Sciences; University of Yaoundé I, Cameroon

Dr Nene Ahidjo, D.Pharm

PhD student, Neuroscience, Faculty of Medicine and Biomedical Sciences, University of Yaoundé 1, Cameroon

Miss Tankeu Francine

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PhD student, Biology and Animal Physiology, University of Yaounde I, Cameroon

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I. Overview

1. School description

The burden of neurological disorders has critically increased in Central Africa in the last decades. Several researchers of the region are mobilizing efforts to address this burden but lack adequate training in Neuroscience.

This school was organised to provide effective training in basic neuroscience, create motivation and give networking opportunities to young researchers engaged in the neurosciences specialty, who use small animal as experimental models of study. The program focused on basic biology techniques, as well as specific neurological diseases covering Parkinson's disease, Epilepsy and Stroke. The lectures covered a broad range of topics from neurobiology to clinical aspects of the above mentioned pathologic conditions, animal models of these conditions, to their behavioural assessments in animals. Students conducted hands-on practicals in the physiology of the neuron, immunohistochemistry, western blotting and behavioural testings.

Two key events were a faculty-only session to discuss the future of neuroscience in Cameroon and the symposium on the last day where external faculty presented their own work

2. Participants

The participants at the school were selected by the School Organising Committee. Twenty five (26) students were selected from a list of forty five (45) applicants who met the basic requirements. Four (04) International participants were selected for the school (Chad (01), Republic of Congo (01), Republic democratic of Congo (01), Ivory Cost (01) and twenty three (21) from six of the seven state and private Universities in Cameroon (University of Yaounde I, University of Douala, University of Buea, University of Ngaoundere, University of Dschang; and the University of Bamenda).The selection committee gave the priority to female candidates with equal qualification. All qualified international applicants were selected. However, one from the Democratic Republic of Congo couldn't come due to visa issues.

	FIRST NAME	LAST NAME	Gender	RESIDENCY (CITY/COUNTRY)
1	Aliance Romain	Fokoua	Male	Dschang/Cameroon
2	Ahidjo	Nene	Female	Yaounde/Cameroon
3	Arielle	KouamouNdieudieu	Female	Yaounde/Cameroon
4	Armelle Rosalie	AmbassaMbang	Female	Yaounde/Cameroon
5	Barnabas	MalepMayamabikeck	Male	Yaounde/Cameroon
6	Clarice	DjouwougNoussi	Female	Ngaoundere/Cameroon
7	Edmond Ngwafong	Mouafo	Male	Yaounde/Cameroon
8	Elisabeth Sylvie	Ngoa Manga	Female	Yaounde/Cameroon
9	Florette	MotoumTedjo	Female	Yaounde/Cameroon
10	Franklin	ZemoGamo	Male	Yaounde/Cameroon
11	Gaoudji	Lamido	Male	Ngaoundere/Cameroon
12	Georges	Kuh	Male	Bamenda/Cameroon
13	Ghislain	Loubano-Voumbi	Male	Brazzaville/Congo (Absent)
14	Judith	PouadjeuManialeu	Female	Dschang/Cameroon
15	Luc Donatien	IlouminінMoutila	Male	Yaounde/Cameroon
16	Mbiydzenyuy	NGALA	Male	Yaounde/Cameroon
17	Mireille Sylviane	DongmoNguepi	Female	Buea/Cameroon
18	Modeste	Wankeu-Nya	Male	Douala/Cameroon
19	Pacome	Kouadjio N'Go	Male	Abidjan/IvoryCost
20	Pius	Tseuguem	Male	Dschang/Cameroon
21	RudigNikanor	DjikemTadah	Male	Yaounde/Cameroon
22	Renaud Joseph	Menanga	Male	Yaounde/Cameroon
23	Sabine Adelline	Fanta Yadang	Female	IMPM/Cameroon
24	Sandrine Lauriane	NdjoulouBadiana	Female	Ngaoundere/Cameroon
25	Sandy Eva	DiogneTadom	Female	IMPM/Cameroon
26	Souhoudji	Themoi-Demsou	Male	Casablanca/Morrocco D'jamena/Chad

Table 1: List of the students

3. Faculty

We invited national and international researchers from different universities to teach during the school. Two of the invited international speakers (Dr. Catherine Heurteaux, France and Dr. Wael Mohamed, Malaysia/Egypt) had an impediment and couldn't come. A total of ten guests' speakers taught during the school.

	NAMES	ADDRESS	SCIENTIFIC INTEREST	EMAIL
1	Pr. James Olopade **(JO)**	University of Ibadan, Nigeria	Neuroanatomy and environmental neurotoxicology	jkayodeolopade@yahoo.com
2	Pr. Richard Brown **(BR)**	Dalhousie University Halifax, Canada	Behavioural Science, Biological, experimental psychology	rebrown@dal.ca
3	Pr. EvelyneSernagor**(ES)**	Newcastle University, UK	Retinal neurobiology developmental neuroscience	evelyne.sernagor@ncl.ac.uk
4	Dr. Nguemeni Carine **(CN)**	University hospital, Würzburg, Germany	Neuropharmacology, Rehabilitation, Stroke, Parkinson, Multiple Sclerosis	nguemeni_c@ukw.de
5	Pr. Torimiro Judith **(TM)**	UYI Cameroon	Molecular Biology	Jntorimiro@gmail.com
6	Pr. KuateCalixte**(KC)**	UYI Cameroon	Neurology	kuate.callixte@gmail.com
7	Pr. Njamnshi Alfred **(NA)**	UYI Cameroon	Neurology	alfredknjamnshi@gmail.com
8	Pr. Pieme Constant A **(PCA)**	UYI Cameroon	Biochemistry, phytotherapy	apieme@yahoo.fr
9	Pr. YacoubaMapoure **(YM)**	University of Douala, Cameroon	Consultant Neurologist, Vascular Neurology	mapoureyacouba@gmail.com
10	Pr. Fokunang Charles **(FC)**	UYI Cameroon	Pharmacology, Toxicologist	charlesfokunang@yahoo.co.uk

Table 2: Names and affiliations and scientific interest of the School Faculty

An overview of the school timetable can be found below. We will describe the daily activities in the next sections.

Program of the IBRO-ARC/ISN neuroscience school in the medicine faculty of the University of Yaoundé 1, Cameroon:
The full names and affiliations of the speakers have been mentioned above.

	Monday 23th July 2018		**Tuesday** 24th July 2018		**Wednesday** 25th July 2018		**Thursday** 26th July 2018		**Friday** 27th July 2018
8h00-9h00	End of registration	8h00-8h45	Can Phytotherapy help for management of neurodegenerative diseases in Africa? **JO**	8h30-9h00	Ethics on Animal use in research **FC**	8h00-9h30	Statistics and good research practice in neuroscience **ES**	8h00-08h45	Opening of the symposium **JT**
9h00-9h30	**Welcome words** **CN/PCA**	8h45-9h50	Stroke: *in vivo* models **CN**	9h15-10h15	Neuronal membrane physiology (part 2) **ES**	9h30-10h15	Survival skills in academia as a neuroscientist **Panel discussion**	08h45-10h15	**SYMPOSIUM** External faculty presenting their own work **ES/YM/CN** (20 min per presentation)
9h30-10h15	Advocacy talk: Neuroscience in Central Africa **NA/JO**	9h45-10h15	Pathophysiology of Stroke, clinical context **YM**						
10h15-10h30	**coffee break**	**10h15-10h30**	**coffee break**	**10h15-10h30**	**coffee break**	**10h15 - 10h30**	**coffee break**	**10h15-10h30**	**coffee break**
10h30-11h30	How to do behavioural tests **BR**	10h30-11h30	Understanding the pathophysiology of Parkinson's disease **YM**	10h30-12h30	How should we be training students of neuroscience for tomorrow? **BR**	10h30 - 12h30	Oral presentation of students session 1	10h30-12h30	KEYNOTES LECTURE **BR**
11h30-12h30	Western blotting: Do and Dont's **JO**	11h40-12h30	Immunohistochemistry: Do and Don'ts **JO/CN**						
12h30-13h30	**Lunch break**	**12h30-13h30**	**Lunch break**	**12h30-13h30**	**Lunch break**	**12h30 13h30**	**Lunch break**	**12h30-14h30**	**Lunch break**
13h30-14h15	Neuronal membrane physiology (part 2) **ES**	13h30-16h15	**PRACTICAL 3 GROUPS -Behaviour BR, Dr. Fotsing and Dr. Nene -Brain dissection and histology CN and Dr. Biapa - Neuronal membrane physiology and western blot ES/JO and Dr. Biapa**	13h30-16h15	**PRACTICAL 3 GROUPS -Behaviour BR, Dr. Fotsing and Dr. Nene -Brain dissection and histology: CN and Dr. Biapa - Neuronal membrane physiology and western blot ES/PCA and Dr. Biapa**	13h30 - 17h30	Oral presentation of students session 2	14h30-17h00	**Closing ceremony with award for students And Thank you notes Prof. Ze Minkande Dean of the faculty**
14h30-18h00	**PRACTICAL 3 GROUPS -Behaviour BR, Dr. Fotsing and Dr. Nene -Brain dissection and histology: CN and Dr. Moukette - Neuronal membrane physiology and western blot ES/JO and Dr. Biapa**	**16h15-16h30**	**Coffee break**	**16h15-16h30**	**Coffee break**				
		16h30-18h00	Neuronal Wiring and Epilepsy **KC**	**16h30-17h30**	How to write a good paper? **BR**	**17h30 - 20h30**	**Social and Diner**		
				17h00-18h00	Writing time for students' reports				
18h30-20h30	**Diner**	**18h30-20h30**	**Diner**	**18h30-20h30**	**Diner**				

4. Learning objectives

At the end of the school, participants should:

- Be able to understand the basic neurobiology of the neurons and simples aspects of neuronal function like neuron resting and action potential
- Have a good overview of the potential of phytotherapy against neurological diseases in Africa
- Be able to describe the physiopathology of Parkinson disease, epilepsy and stoke; the available therapeutic options and the clinical challenges
- Be able to perform simple behavioural tests in mouse and plan experimental designs that include immunohistochemistry and western blotting as method (in small animals)
- Improve their analytical, presentation and writing skills
- Be more motivated and better equipped to pursue research in neuroscience

5. Students' backgrounds and pre-school assessment

The graduate students selected for the school had a background in neurobiology. More than 50% of them worked on the neuroprotective and/or therapeutic effects of medicinal plant extracts on the nervous system in various physiological or clinical conditions. Our pre-school assessment showed that **an average of 52% of the students had never been to a neuroscience school before. 40% of them only had a theoretical background in the techniques that were presented in the practical sessions.** Most importantly, we found that students were motivated to pursue a career in research but felt discouraged by the limited training, infrastructure and the lack of opportunities. To the question: **"How prepared do you feel you are to pursue a research career that involves competitive Neuroscience research grants?" 98% of the students answered: "not at all".**

6. Accommodation and Transportation

The students and Faculty were accommodated in two hotels (hôtel Sinaha, hôtel La Residence). These hotels are located within 100 meters from the Faculty of Medicine and Biomedical Science (FMBS) of the University of Yaounde 1, Buses of the FMBS were used to pick up and drop the students and Faculty from the hotels to the lecture halls and other social events.

II. Day to day activities:

Most of the participants (including lecturers) to the school arrived between July 21st and July 22nd to Yaoundé. They were picked-up from the airport by the organizing committee and were accommodated at their respective hotel. The students from the University Of Yaoundé 1 arrived directly for the registration on Monday July 23rd.

1. DAY 1- Monday, 23rd July 2018

a) Opening ceremony

The opening ceremony was opened to the entire faculty including researchers and students that were not registered as participants to the school. The rector of the University of Yaoundé I Prof. A.M. Sosso was unfortunately tied to other administrative activities and couldn't be present to open the school. Professor Constant Anatole Pieme therefore stepped in and welcomed participants and the university staff and his fellow colleagues. The morning session which started with an advocacy talk was coordinated by Dr Carine Nguemeni. The advocacy talk was also opened to the entire faculty and university.

b) Advocacy Talk: Neuroscience Advocacy in Central Africa

Pr. James Olopade, Nigeria and Pr. Alfred Njamnshi, Cameroon

Prof. Olopade in this talk first situated Central Africa and listed countries that comprised this African sub-region. He itemised some of the key challenges that have bedevilled neuroscience education and research in Africa. He also noted that the Central African sub-region accounts for only 9.1% of total publications on neuroscience in Africa, emphasising that most of these are either in predatory journals, journals with very low impact factors or in journals that are not indexed. He ended his presentation by proposing the opportunities for different research areas and the solutions that can be used to develop research in neuroscience in Central Africa and improve publications. Among the recommendations he proposed, mentoring, effective networking and collaboration were the most important. He shared his career experience and the benefits of participating in IBRO and ISN schools.

The second part of the advocacy talk was specifically a case-study scenario through which disease-condition burdening a community or region could spur up scientific education, research, networking and collaboration. This second part was conducted by Prof. Alfred Njamnshi in which he presented the results of years of research on neurological connections of river blindness (schistosomiasis) and epilepsy.

They concluded by telling the audience that interdisciplinary, fruitful collaboration and good science are at the bottom of sustainable South-South or intra-continental collaboration.

The advocacy talk was followed by three lectures that covered the theoretical background necessary to perform the practical sessions during the school.

c) **Lectures**

Lecture 1: How to do behavioural test in neuroscience, Prof. R. Brown, Canada

Prof. Brown contextualized his lecture by first introducing fundamental concepts such as bioassay, types of bioassays, errors which can occur during an assay. He then focused his lecture on behavioural bioassays, definition of behavioural bioassay, description, how to conduct quantitative and qualitative behavioural bioassay. The rest of his presentation focused on the description of material and different methods used to evaluate different behavioural assay related to memory, emotion, motivation, preferences and neuronal changes. He ended his presentation by demonstrating the method to evaluate and standardize behavioural bioassays.

This lecture prepared the students to the practical sessions on behavioural testing in rodents.

Lecture 2: Western blot do and don't, Prof. James Olopade, Nigeria

Prof. Olopade stated the fundamental principles underlying Western Blotting as well the uses of the technique. He described and listed the different steps of the assay with the different buffer solutions and their role. He insisted on 3 keys aspects that directly impact the quality of the assay: (1) a good separation of protein from mixture through electrophoresis, (2) efficient transfer of separated protein to a solid support; (3) specific detection and marking of a target protein by matched antibody for visualisation.

The lecture provided a good fundament to the afternoon's practical session.

Lecture 3: Basic Electrophysiology Principles, membrane potentials and neuronal signalling, Prof.E.Sernagor, UK

Shebeganthe lecture by defining an electrical potential (Vm), resting membrane potential (Vrest) relation between electrical potential and equation of Nernst, ion permeability and concentration of Na^+, K^+ and Cl^-. After a brief description of a neuron, she describes the mechanism of excitability of neurons and the propagation of electrical signal. She continuedby explaining the importance of concepts in membrane excitability followed by the properties of the voltage-gated Na^+ and K^+ channels, She endedher talk with the role of the myelin sheath in signal propagation in myelinated axons and synaptic transmission with implications in neurological and neurodegenerative conditions.

This lecture prepared the students to the practical sessions on the neuron in action.

d) **Brief summary of the practical**

The practical work during the IBRO-ARC/ISN school took place every afternoon for the first three days in three different laboratories. Students divided into three groups that rotated in each laboratory (one lab everyday) to do the behavioural tests, the western blot and biophysical properties of the neuron, dissection of the rat brain and histology.

- Lab 1: Brain dissection and staining/Immunohistochemistry:

Dr. Carine Nguemeni was in charge of this part of the practical work. She demonstrated the dissection of the rat brain. She then performed coronal and sagittal sections of the dissected brain to show how to navigate the anatomy of the brain, found anatomical line marks used to recognize various brain structures. The students had the opportunity to dissect their own rat brains. The second part of the practical covered the microscopic observation of immune-stained rat brain sections with the antibody NeuN and histological section stained with cresyl violet.

- Lab 2: Behavioural Tests

Led by Professor Richard Brown, the students followed the explanation and demonstration of 4 behavioural tests namely Open field test, Forced Swim Test, Balance Beam, Elevated plus maze. The students were then divided into smalls

groups in order to perform the tests. He also took time to answer all the questions related to execution of those tests.

- Lab 3: Western Blot and the neuron in action

Prof. James Olopade presented and explained the electrophoresis and western blot material, gave their roles before going on to demonstrate this technique. The students got the opportunity to try to use the material themselves.

The second part of the practical in this lab was conducted by Prof. Evelyne Sernagor. She used of the software *Neurons in Action* which uses a set of interactive tutorials based on the professional stimulator NEURON (a virtual simulation environment for computer neurosciences). Using the tutorial that was presented by Prof. Sernagor, the students explored the neurophysiology of the neuron, the generation of action potential, and neuronal signal control in a virtual environment.

2. DAY 2- Tuesday, 24th July 2018

The lectures of this second day covered basic and clinical aspects of three neurological diseases: Stroke, Parkinson's disease and Epilepsy. An introductory lecture focused on phytotherapy as a potential therapeutic option for neurological disease in Africa.

Lecture 1: Can phytotherapy help for management of neurodegenerative diseases in Africa? Prof. James Olopade, Nigeria

In this lecture, he reminded participants of the natural wealth of Africa's ecological diversity and its endowment with plants of untapped medicinal potentials. He then emphasized the soaring neurological burden that has overwhelmed our fragile health system and exhausted the wit of the pharmaceutical intelligentsia. He listed several drugs that have been discovered from plants as well as plant chemicals that have been used to further our understanding of synaptic transmission. He mentioned that due to microbial resistance to drugs available, phytotherapy was advancing and becoming a most solicited alternative. He also cautioned on adherence to sound scientific methods, stating that the plants must be screened for biological activity, isolated, characterized, and their efficacy must be evaluated through clinical trials before they can be approved for use. He stated that, it is this good science that spurs

development. He admonished participants that although the process of development of drugs is a long one, the result of such research is very rewarding. He shared the results of his research on the phytochemical management of vanadium-induced neurotoxicity with the audience.

Lecture 2: **Stroke "in vivo" models, Dr. Carine Nguemeni, Germany**

Dr. Nguemeni started her lecture by defining stroke and discussing the risk factors associated with the pathology. She then described the physiopathology of stroke as well as the deleterious cascade leading to cell death and impairments after stroke. Moving from the clinical aspect of stroke, and after comparing the cerebrovascular system of humans and rats, she described various experimental models that can be used in small animals to study neuroprotective, therapeutic or rehabilitative interventions against stroke. For each model, she presented a step-b-step protocol on how to perform it and the common pitfalls in performing it. Some models that were described included the middle cerebral artery occlusion model, the two-vessel occlusion model, the Endothelin-1 stroke model and the photothrombotic model. She emphasized that studies on stroke should take into consideration the nature of the stroke, the location of the infarctus, its duration and severity, the comorbidity factors, the age of the sex and the genetic background. After comparing, she described the steps of induction of an animal model of stroke and cited the other models.

Lecture 3: Pathophysiology of Stroke, clinical context, Prof. Y. Mapoure, Cameroon

After the talk on "in vivo" model of stroke, Prof. Mapoure from the general hospital of Douala gave a short overview of the daily life in his stroke clinic. He started by telling the audience that stroke is the leading cause of hospitalization in neurology in Cameroon and that there is no stroke intensive care unit in Cameroon. The only therapeutic option which is the tissue activated plasminogen is not available in Cameroon. He said that 52% of the cases of stroke in his clinic were ischemic. Hypertension and chronic consumption of alcohol were the main two risk factors observed in stroke patients in his clinic. He therefore insisted on the management of risk factors in order to reduce the occurrence of stroke, suggesting the extension of community-based study for the awareness of the population leaving in remote areas.

Lecture 4: Understanding the pathophysiology of Parkinson'sdisease, Prof. Y. Mapoure, Cameroon

Prof. Mapoure started his presentation by defining voluntary and involuntary movement as well as the different types of motricity. He underlined that there is a necessity to have equilibrium between the direct and indirect pathway of the pyramidal neuronal tract to have a normal motor function. He described the brain structures that are involved in the physiopathology of Parkinson's disease. He described the neurochemistry associated to the dopaminergic neuronal controls as well as the possibilities of treatment with Levodopa. He then explained the possible involvement of the Gut-Brain axis in the development of Parkinson's disease and used several examples of his own clinical work to support his presentation.

Lecture 5: Immunohistochemistry: Do and Don'ts, Dr. Carine Nguemeni, Germany and Prof. James Olopade, Nigeria

Dr. Nguemeni started her presentation by explaining that immunohistochemistry (IHC) is used for several purposes to demonstrate the binding of antibodies to specific antigens present in the tissue or cell for the specific localisation without destroying the structure of cell or tissue. She gave the history and the evolution of use of IHC. She then described the principles of IHC followed by the steps of IHC (Sample preparation, fixation, sectioning, storage, staining, revelation (visualisation)). She ended her presentation with various troubleshooting strategies and alternatives to certain steps as applicable to resource poor settings. Basic laboratory requirements for conducting sound IHC were also mentioned. Prof. Olopade concluded the lecture by presenting some typical IHC staining and their interpretation. He underlined that IHC techniques usually get complemented by a quantification method like western blotting that he had previously described.

Lecture 6: Neuronal Wiring and Epilepsy, Prof. C. Kuate, Cameroon

The presentation of Prof. Kuate outlined the pathophysiology of epilepsy with focused on clinical aspects. After defining seizures and epilepsy, he described, compared and classified the different types of seizures before giving the complex network involved in the seizure. During the very interactive presentation, he showed some case study and videos of patients suffering from Epilepsy. Because of the wide interest in

research on epilepsy among the students, Prof.Kuate spent some significant time answering their questions.

3. Day 3 - Wednesday, 24th july 2018

Lecture 1: Ethical issues associated with the use of animals for experiments, Prof. C. Fokunang, Cameroon

He started his presentation by a question: Should animals be used as research subjects? While mentioning the ways in which animals have been helpful to human existence and sustenance, he highlighted that their use in experimentation is based on commonalities and variation in genetic make-up and physiology. He gave a scientific rendition on the genesis legal obligations and humane responsibilities for the use of animals in research. He mentioned the various regulatory bodies in-charge of overseeing conduct of good research using animals. While noting that clinical research is quite regulated in Cameroon, animal research ethics regulation is still nascent. He also highlighted the steps of assessment and accreditation of laboratory for animal use in research. Resonating through his presentation werethe rules of 3 Rs (Reduce, Refine and Replace) which should be taken in consideration each time animal are planned to be used for research purpose. He concluded his presentation with the statement "*Use of animals in research activities is a privilege and not a right. It is a privilege that a scientist or an institution can lose if the ethical requirements arenot satisfied.*"

Lecture 2: Neuronal membrane physiology, Prof. E. Sernagor, UK

Prof.Sernagor completed the lecture that she had started on Monday covering the neuronal membrane physiology. She talked about the physiology of the synapses and the principles governing neurotransmission.

Lecture 3: How should we train student for the future of Psychology and Neuroscience, Prof. R. Brown, Canada

Prof. Brown began his presentation by revealing his academic and professional background through "my life in Psychology / Neuroscience". He defined psychology and neuroscience, gave the different disciplines of these two sciences before showing the link between them. He asked a question: **is it possible to do neuroscience without psychology?** Then demonstrated the interdependence of

the two disciplines, gave the seven pillars of Research Domain criteria for the future of these sciences, underlining the work of Donald Hebb who militated extensively for the integration and interdependence of psychology and neuroscience. Prof. Brown pointed out that making an academic career in neuroscience is not easy, but the instruments and steps that can enable progress in this area include academic mobility, national and international networks, establishment of a program and the training of qualified teachers. For the development and expansion of neuroscience in the future, he proposed that training in this area should consider ten essential points including: the expertise in modern neuroscience techniques, rigorous experimental design and statistic techniques, interdisciplinary training, sub-field of neuroscience, introduction of ITC in neuroscience, grant writing…, clinical application of basic neuroscience…. etc. He said that neuroscience could be involved in all aspects of the life (education, economic, culture etc) and impact the life of the society. He concluded his presentation by saying that *"Training in neuroscience must be interdisciplinary and can involve sciences, engineering, computer sciences, arts and humanities".*

Lecture 4: How to write a good publication, Prof. Brown, Canada

Since the Wednesday was the last day for practicals, students were asked to prepare their lab reports. To support the writing activity, Prof. Brown gave a short lecture in on how to write a good paper. He used the presentation of Gallo Diop/Raj Kalaria as support of his lesson titled "getting your work published". He sub-divided lecture into 9 lessons with one special idea in each lesson. In the lessons one to four, he explained the things to consider before writing a paper such as: have something significant to write, understand the field, methods used; advantages and disadvantages, values and limitations of the ideas, understand the structure of a scientific article. In lesson five which focused on **effectively writing your manuscript**, he explained the different parts of a manuscript, how to structure different part of the manuscript (abstract, introduction results, discussion and conclusion), what to do and not do. He listed the consideration to take when choosing a journal for publication (age, impact factor, speed of publication, publisher, and quality of publication and international coverage).In subsequent lessons he covered reasons manuscripts are rejected and reacting to manuscript rebuttals.

At the end of the lecture, students who had been divided into several groups of 3 participants were given time to write their lab reports focusing on one of the four labs

that they have done during the three days. The best report received a price at the end of the school.

While students were writing their report a special faculty-only session took place in the refectory.

This was a meeting of the local teaching staff and external faculty on **the future of neuroscience program in Cameroon after IBRO-School Yaounde 2018**.

Local faculty exposed the state of neuroscience in Cameroon both at the academic and research level. They pointed out that there are several ongoing research projects in several aspects of neuroscience although they are not as widespread in all the universities. The difficulties accounted were mainly those related to research equipment and qualified teachers in some disciplines of neuroscience. Also, the teachings of neuroscience are included in the physiology curriculum. They indicated that there is an undergraduate program in neuroscience in Cameroon. Only the University of Yaoundé I had recently opened a master's degree program in neuroscience. The external faculty exchanged the experiences of their institutions with the local faculty, before raising the need to strengthen institutional exchanges to build the capacity of local faculty in neuroscience programme. At the end of this meeting, the advice was to build capacity of students through master degree programme in Neuroscience and organise and affiliate a Cameroon Society of Neuroscience (CSN) to other international Neuroscience societies. A resolution was taken by the local faculty present at the meeting, to connect with their fellow colleagues in other universities to organize a first neuroscience day in 2019.

4. Day 4 - Thursday, 26th July 2018

Lecture: Basics on statistical approaches to analyse scientific data and prepare it for publication, Prof. E. Sernagor, UK

This lecture was a key point of the training of the student because one of the school objectives was to improve the analytical skills of the students. Prof. Sernagor first defined the word “data” obtained from experimental research. She explained how data obtained from research could be treated, and mentioned that the analysis of data depends on nature of study. She insisted that “*without good statistical analysis good science may not be communicated effectively”.* She defined several key

concepts including variables (quantitative and qualitative), continuous and discrete, parameters and statistics. She then detailed the necessary steps in analysing data (descriptive statistics and inference). She highlighted on graphical representation of quantitative and qualitative data, the measures of central tendency and dispersion. She addressed the question of when to use the standard deviation (SD) or the standard error of mean (SEM). She further covered in her lecture Inferential analysis including hypothesis testing (tests with 2 groups: Parametric: t-test, non-parametric: Mann-Whitney/Wilcoxon rank sum test; tests with more than 2 groups: parametric: Analysis of variance (one-way ANOVA), non-parametric: Kruskal Wallis). The session was very interactive and the speaker received several questions from the students.

As one of the school objectives was **to motivate the participants and better equip them to pursue research in neuroscience**, the stage was given to four speakers for a panel discussion on surviving skills in academia as a neuroscientist.

The panellists were: Prof. A. Njamnshi, Cameroon, Dr. Carine Nguemeni, Germany and Dr. Bruno Moukette, Cameroon.

Prof.Njamnshi gave his advice with the perspective of a senior scientist who has already climbed the steps of the academic ladder. Dr. Carine Nguemeni, as a research fellow talked about her way toward scientific independence and the access to a group leader position. Dr. Bruno Moukette, who had recently received his PhD talked about how to secure a post-doctoral position in a good laboratory. The three panellists agreed that there are many difficulties along the way, especially in third-world country but excellence, hard-work and effective networking can open many doors. More importantly, planning and anticipation along with a road-map containing plan A, B and C could help to have clear vision about the future. There was also an agreement that meeting the right people at the right time has played a role in each of the panellists' stories. They insisted on self-training (identifying the skills that you need to develop in order to meet your goals and train for them), and the importance to develop good writing skills in order to attract financial support and research fellowships. The discussion continued over the coffee break.

Oral presentation of the students on their research

Jury: Prof. Richard Brown, Prof. Njamnshi Alfred, Prof Evelyne Sernagor, Prof. Constant Anatole Pieme, Dr. Prosper Biapa, Dr Carine Nguemeni

During this session, 26 students were given 8 minutes each to present their research. After their presentations suggestions, recommendations were given by the jury to each student. Three students were selected for the award of the best presentation.

III. Social event

At the end of this very long day, faculty and students were ferried to the restaurant "ENAMIEN" located near the Higher Teacher Training College, a nice venue on one of the seven hills of the city Yaoundé above the municipal lake. The group discovered the culinary diversity and richness of Cameroonian food. The dinner was animated by live traditional music from the centre region of Cameroon. Everybody got the opportunity to execute some dance steps following the drums and balafon's invitation in a relaxed atmosphere.

IV. Symposium

Day 5- Friday, 27th July 2018

The last day of the school consisted of a symposium where three external faculties presented their own research to the audience. This session was chaired by Prof. Judith Torimiro, head of department of Biochemistry at the medicine Faculty of the University Of Yaoundé 1, Cameroon.

Prof. Sernagor presented her amazing work on **retinal maturation** and showed one of the most advance techniques that she uses in her laboratory: the extracellular recordings of retinal neurons using multi-electrode arrays. Prof. Mapoure, who is the head of the neurology department at one of the biggest hospital in Cameroon (the general hospital of Douala), presented several clinical studies that they have done in the last ten years, covering **stroke, meningitis, HIV/AIDs associated neurological disorders and diabetes**. Dr. Nguemeni gave a talk on her journey from basic to clinical science. Her presentation took the audience from her study using **omega-3**

as neuroprotectant against stroke in an animal model to her current work in clinical neurophysiology.

The symposium ended with an exciting keynote lecture of Pr. Richard Brown, distinguished professor of the University of Dalhousie, Canada, on “The future of neuroscience in Cameroon”. The keynote address was to push for the development of neuroscience in Cameroon.

After the talk, the students also received from Prof. Brown a generous donation of 24 text books covering topics like neuroanatomy, statistics, writing advice, behaviour… from renowned publishers. This donation will further the education of the students who otherwise do not have access to such educational material and foster a long-lasting after-school impact.

In agreement with IBRO schools guidelines, the students of the IBRO School Yaounde 2018 elected an IBRO president and secretary to join the IBRO alumni. **Mr. Zemou Franklin** from the University of Yaoundé I and **Mrs. Judith Pouadjeu** from the University of Dschang, Cameroon, were elected as president and as secretary, respectively.

A facebook page specific for the school was created to serve for regular communication and information. Several photos and videos are posted on the page.

https://www.facebook.com/IBRO-ARC-School-Yaounde-2018-2103300186657533/

The Dean of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, Professor Jacqueline ZE MINKANDE, chaired the closing ceremony where awards and certificates were given to the participants.

V. Feed-backs and post-school assessment

The participants to the IBRO-ARC/ISN school 2018 in Yaoundé, met most of the learning objectives that we had set at the beginning of the school. The participants had the possibilities to interact with each other in an interdisciplinary setting. There were many opportunities to network and get informal mentoring from the faculty during coffee breaks, lunches, social activities.

The post-school evaluation showed a great improvement of the knowledge of the students in all the aspects covered by the school (theoretical and practical). **92% of**

the participants reported that the school had improved their overall confidence and 98% of them expressed their satisfaction (**51%** and **47%** rated the school as **very well** organized and **well** organized respectively). At the faculty level, the school also contributed to revitalize existing collaborations within the university and opened doors to new international collaborations.

The university administration expressed satisfaction and their urgent need for more similar schools.

VI. Future directions and conclusions

The school benefited both the students and the local faculty, contributing therefore to building capacity in neuroscience in Cameroon. Understanding how to prevent and treat neurological disorders and diseases is a challenge in Cameroon and in Central Africa. This school initiative has also been an advocacy for quality training in neurosciences and biological research. The school generated the enthusiasm of the faculty and researchers who want to leverage on the positive school outcomes to «re»-awaken the scientific community in Neuroscience in the region (See the report of the faculty meeting above). To trigger a sustainable impact and broaden it within Central Africa, we want to renew the initiative in the near future.

VII. Aknowledgements

IBRO School Yaoundé 2018 would like to express a special thanks to **TReNDs in Africa** and **IPMC/CNRS** who donated equipment for the school. The donation remains at the faculty of Medicine and Biomedical Sciences of the University of Yaoundé I in Cameroon and will help several faculty and students in their research. We are grateful for the support of the **University of Yaoundé I and the faculty of medicine** which supported the school by offering their administrative support as well as the venue, the laboratories and several facilities free of charge. Thanks to **IBRO-ARC**, **ISN** and the **Company of Biologists** whose financial support allowed us to organize the school.

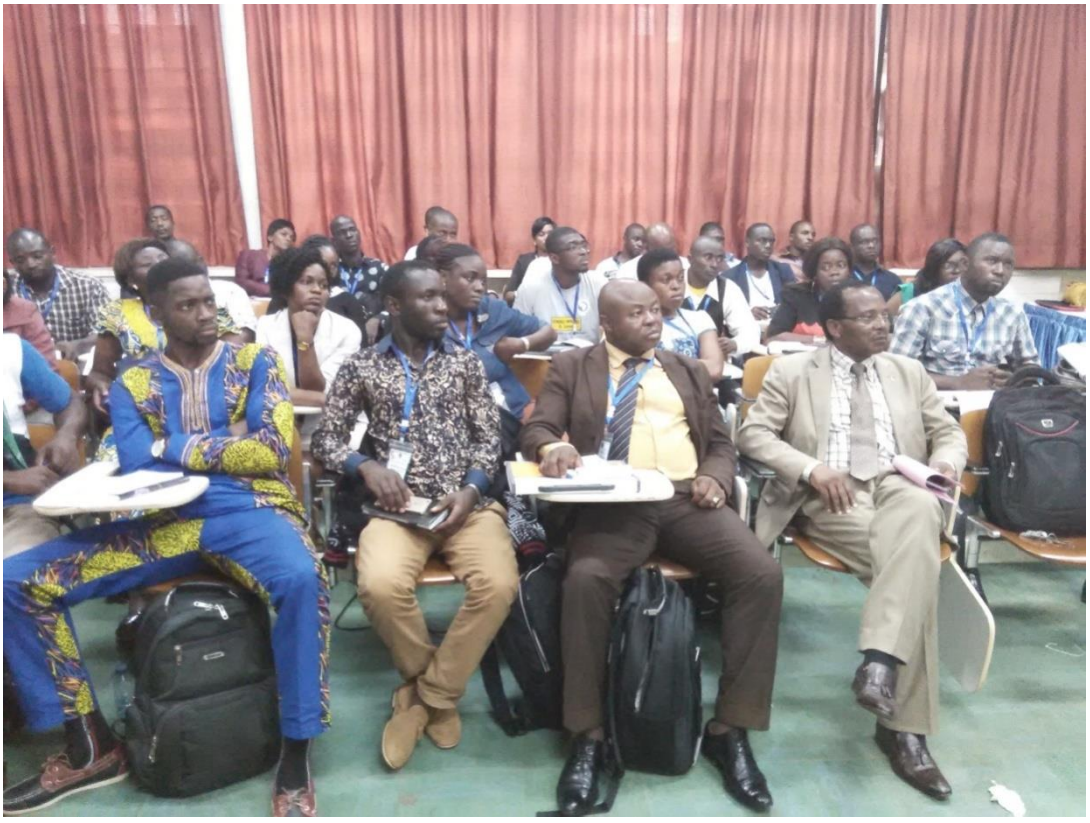
VIII. Financial report

Activity	**Total Income**	**Expenditure (Euros)**
IBRO	**20,000 Euros**	
Travel expenses International faculty (02)		2,600
Travel expenses Local faculty		140
Travel expenses International students and national students from outside of Yaoundé		3,100
Accommodation of students and faculty		4,900
Materials and reagents for practical Session		550
Transportation of donated material and customs		1,650
Feeding (Breakfast, Coffee break, lunch and dinner)		6,380
Social event and awards		600
Cleaning service		80
	Total:	20,000
ISN	**6000 US Dollars (4200 US dollar was send during Pre-school (5,173 Euros)**	**Expenditure (Euros)**
Travel expenses International faculty (01)		2,797.5
Secretariat, printing and didactic materials, IT		1,500
Local Transportation		600
Administrative work		275
	Total	5,172.5
Compagny of Biologists	**2000 Pounds (2,262.57 Euros)**	**Expenditure (Euros)**
Travel expenses Female international faculty (01)		1,887
Travel expenses Female PhD Students (02)		375.57
	Total	2,262.57

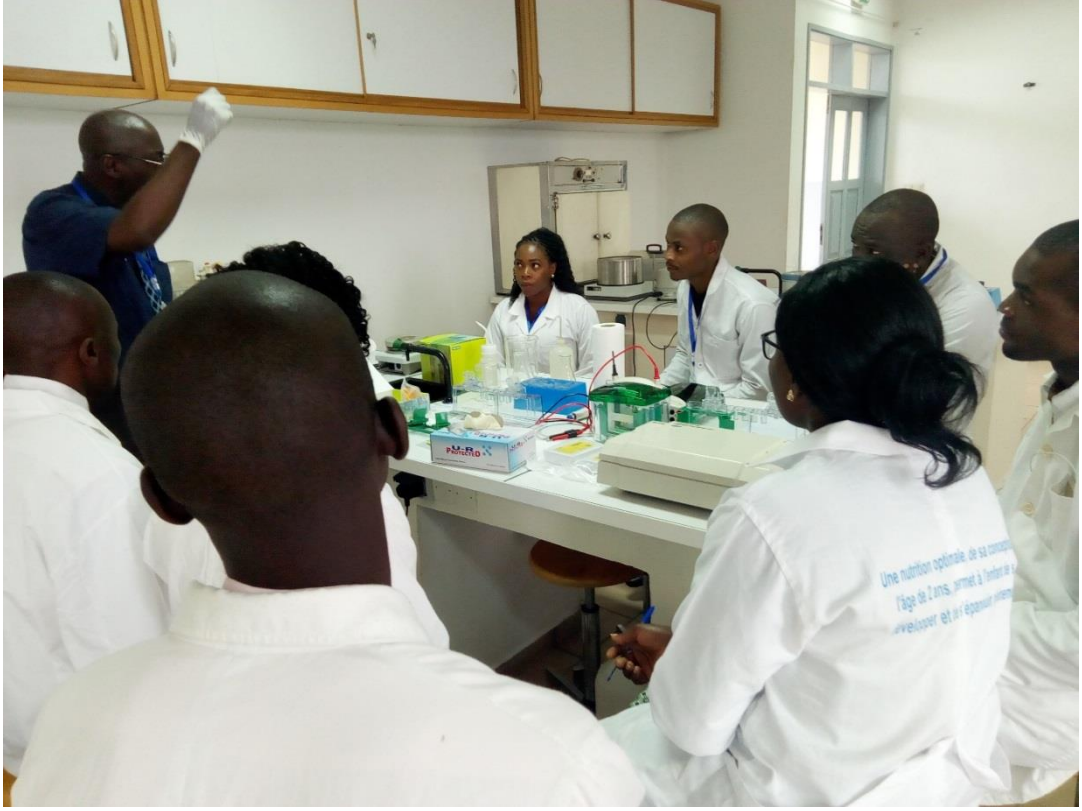
IX. Photos:

ProfessorMapoure responding to a participant's question

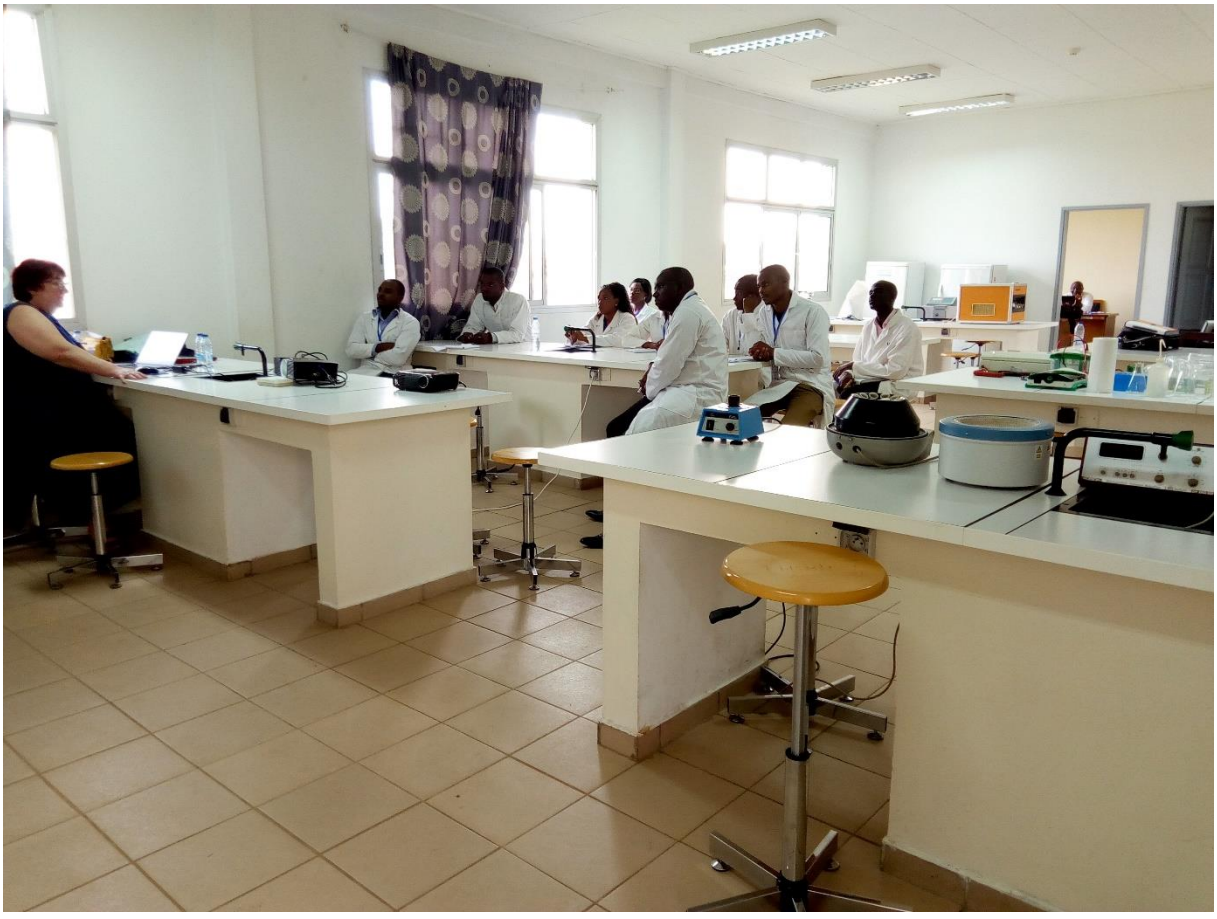
Professor Richard Brown givinga lecture on**“**how to write a good publication”



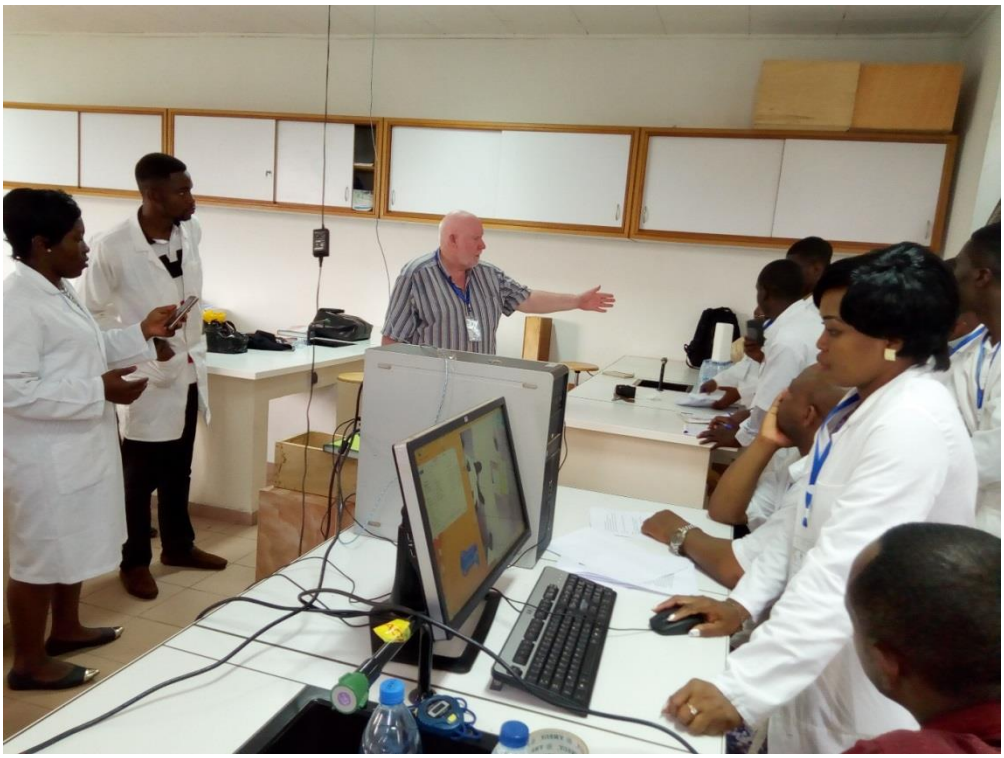
Professor Alfred Njamnshi and student listening to a lecture given by Dr.CarineNguemeni



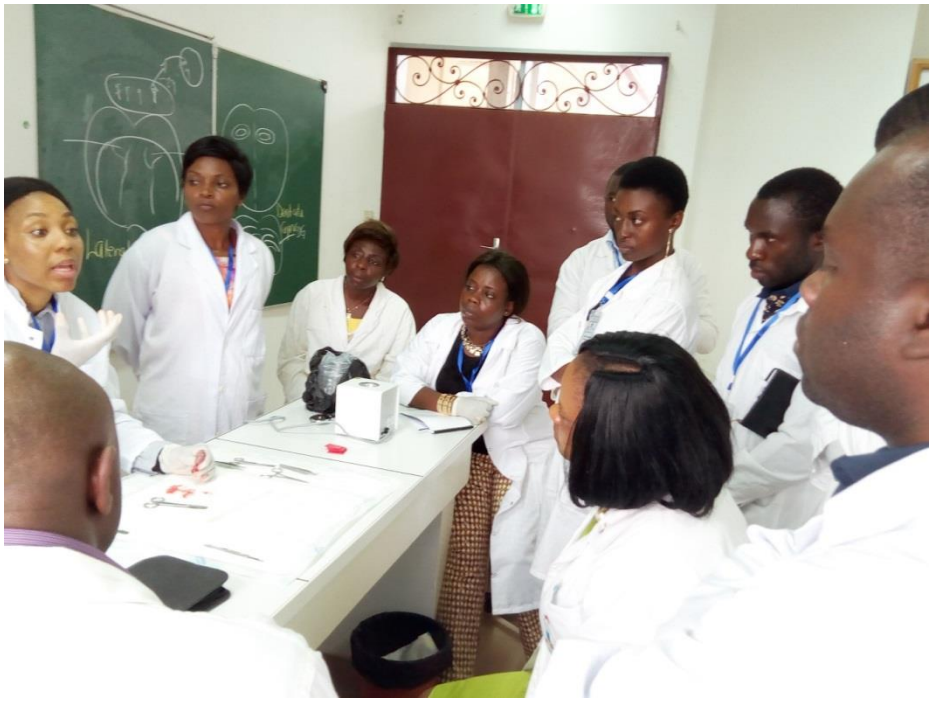
Professor James Olopade demonstrating how to perform Western Blotting during practicals



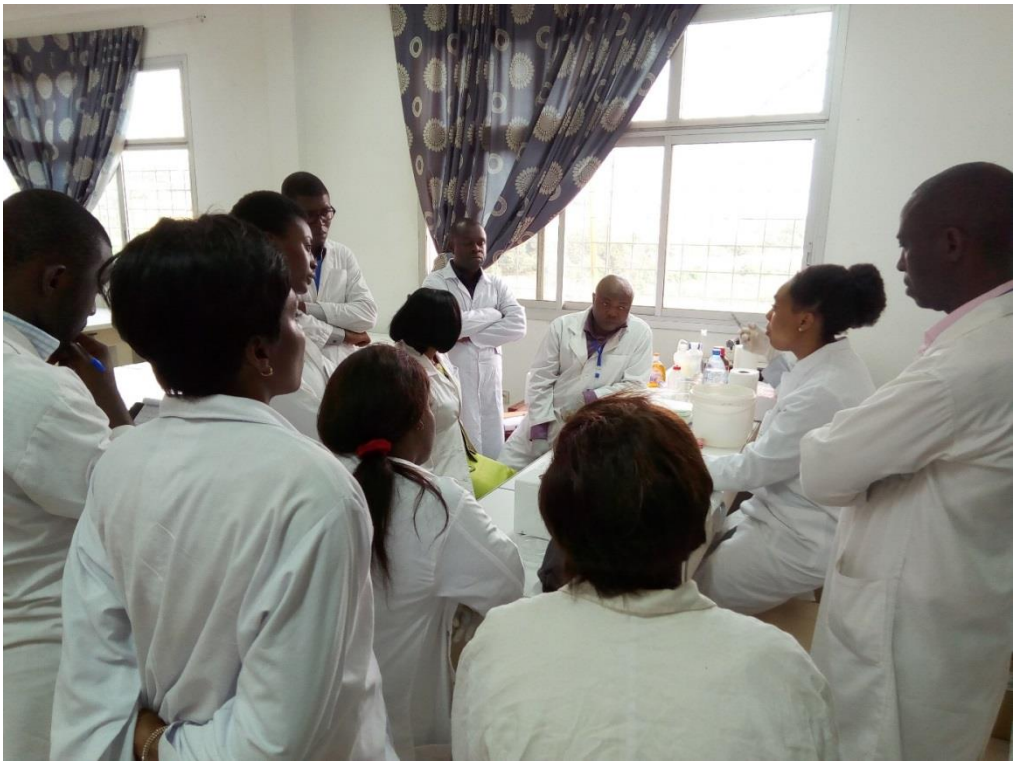
Professor Evelyne Senargortalking about neuronal biophysics



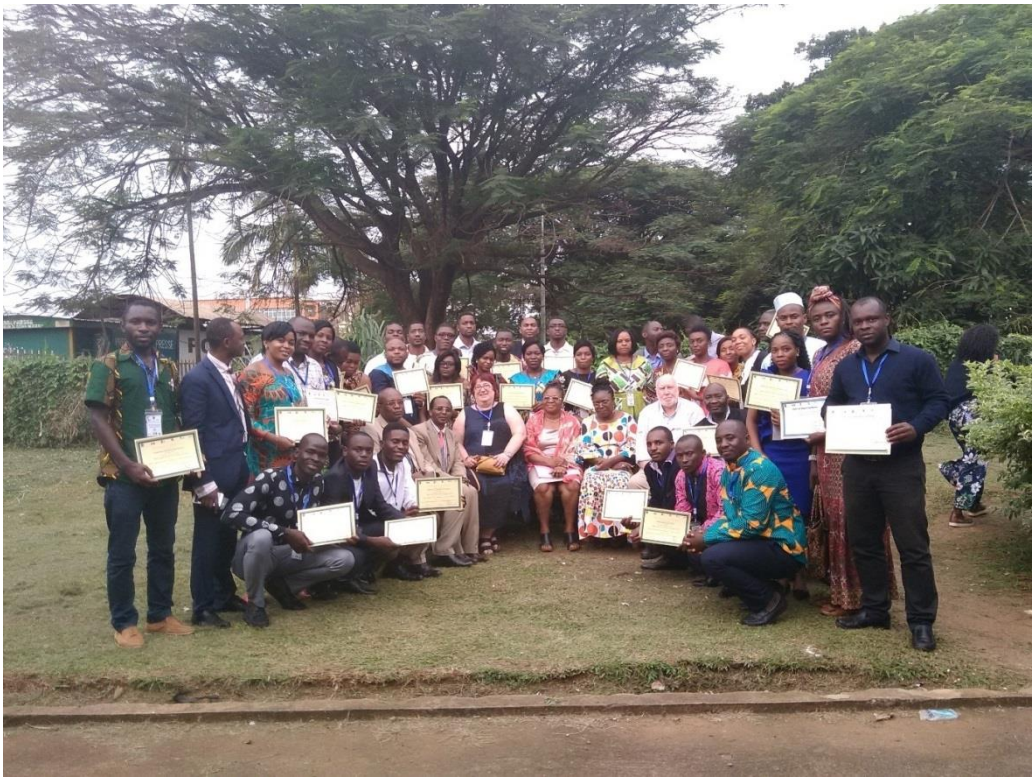
Professor Richard Brown explaining the Open field Test to a group of student



Dr Nguemeni Carine demonstrating the dissection the rat's brain



A group of student listening to Dr Nguemeni Carine describing rat's brain



Participants of IBRO/ARC School Yaounde 2018 with their certificate (Closing ceremony)