Final Report
The International Society of Neurochemistry
6th TReND IRBO-ISN course on insect neuroscience and neurogenetics: From *Drosophila* to mosquitoes

Content of this report

This report contains the following parts in this order:

- Summary of the course including basic information regarding date, location, participants, outline schedule, contents, goals and how they were fulfilled
- This year student's feedback
- Long term student's assessment
- Link to course photos
- List with information on all participants including: name, academic affiliation and rank.
- Break down of disbursement of funds (including funding received from other sources)

In addition we have included the following attachments:

- Full course programme handed to the students
- Booklet handed to students at the end of the course
- Poster used to announce the course
- One photograph of the entire group

Topic of the course

Introducing students to insect neuroscience, from basic concepts to the latest discoveries in the field, with a special focus on state-of-the-art basic science and Africa-relevant problems, all integrated in the frame of promoting the use of low-cost, DIY and open source tools for research.

Location
International Medical and Technical University (IMTU), Dar es Salaam, Tanzania

Dates
24th October – 6th November 2016

Organisers
Lucia Prieto Godino, Tom Baden, Yunusa Garba and Sadiq Yusuf

Countries represented by the students
Cameroon, Ethiopia, Ghana, Madagascar, Malawi, Nigeria, Sudan, Tanzania, Uganda and Zambia

Countries represented by the faculty
Nigeria, Sudan, Uganda, Spain, UK, Germany, China, Australia, USA, Switzerland

Faculty list

Dr. Tom Baden (CIN/BCCN, Tübingen, Germany)

Dr. Sarah Carl (Friederich Miescher Institute, Basel, Switzerland)

Dr. Chuan Cao (University of Cambridge, UK)

Ansa Cobham (University of Ilorin, Nigeria and Monash University, Australia)

Dr. Chris Elliot (University of York, UK)

Yunusa Garba (University of Gombe, Nigeria and University of Konstanz, Germany)

Dr. Franne Kamhi (Macquarie University, Australia)

Dr. Conor McMeniman (Johns Hopkins University, USA)

Dr. Lucia Prieto Godino (University of Lausanne, Switzerland)

Dr. Georg Raiser (University of Konstanz, Germany)

Dr. Marta Rivera Alba (HHMI Janelia Farm, USA)

Dr. Ihab Riad (University of Khartoum, Sudan)

Dr. Steve Rusell (University of Cambridge, UK)

Dr. Juan Sanchez Alcaniz (University of Lausanne, Switzerland)

Dr. Horst Schneider (Innowep, Würzburg, Germany)

Dr. Sadiq Yusuf (St Augustine International University, Kampala, Uganda)

Summary

In this sixth instalment of the TReND neuroscience course, we have educated 14 African scientists from 10 different countries on the latest advancements on insect neuroscience. Furthermore, using this topic we have instructed them more broadly on essential scientific skills such as molecular biology, statistics, scientific writing, and the use of open source technologies to built and tailor lab equipment to each individual needs in an affordable way. The faculty was also diverse, coming from all five continents, including four members of the faculty from three different African countries. Importantly, two of the members of the faculty this year were alumni of this same course, illustrating the long-term sustainability of our approach. This year we kept highly popular modules, such as the one of *Drosophila* as a model for human diseases, and the one on CRISPR genome editing technologies on mosquitoes and *Drosophila*. In addition, we had new modules. On the first week we had an extra module on 3D printing imparted by D. Riad from the University of Khartoum in Sudan, were students learnt about the possibilities of using 3D printing to build lab equipment, and could experiment by using a 3D printer we bought which was locally produced in Dar es Salaam from e-waste. Additionally we had a new module on *Drosophila* as a model for neuronal viral diseases and host-pathogen interaction, which illustrated the usefulness of *Drosophila* as a model for neuronal infectious diseases. As in previous years, we help local capacity building, not only by training local scientist, but we also donated several pieces of equipment to the host institution. This equipment is currently being used by the host institution for teaching and research, as well as by a TReND volunteer, Carolina Matos, who has spent a month at this institution as part of TReND volunteering program that aims at providing sustainable support to African institutions (http://preview.trendinafrica.org/our-projects/teach-in-africa/). Finally, Yunusa Garba, one of the co-organisers, held a session on TReND scientific outreach activities during which many committed to become part of the TReND outreach team, a group of African scientists devoted to communicate science to the public at their respective countries. Thus, the course did not only support African scientists by transmitting new knowledge, but also promoted national and international collaborations, and created a domino effect that is reaching the general public across many African countries.

Rationale behind the school, activities carried out and basic schedule

The goal of the course was to promote state-of-the-art yet affordable research and education in the African continent through the use of insects as model organisms, combined with open source tools. In this 2016 instalment, the course took a more advanced and translational turn, with a strong focus on affordable open science, and topics of particular relevance to the African context. To that end, we again modified the schedule introducing new modules on very recent technologies and developments, taught by new faculty. Importantly, we increased the number of African scientists engaged as faculty, something we aim to keep doing every year. As in previous years, the course has a theoretical part, but it is focused on the laboratory practicals during which students performed experiments using the newly acquired concepts and techniques. In addition, this year we have added a special session between the theoretical and the practical classes focused on critical thinking and discussions with the faculty, which we describe below.

As in previous years, we taught about the advantages of *Drosophila* as a model organism given the genetic tools available in this model and its low cost. Additionally we discussed in which contexts *Drosophila* can serve as a good model for mammalian systems and also how it could

be advantageous given its evolutionary conservation with other insects causing plagues or disease vectors, and in which yet other cases different non-Drosophilid models should be preferred.

Given its success in previous years, we kept a full module dedicated to the use of *Drosophila* as a model for neurodegenerative diseases, where students performed, among other experiments, electroretinograms and behavioural assays in *Drosophila* strains that model important aspects of Parkinson's diseases.

To illustrate the usefulness of *Drosophila* as model to study different aspects neuronal infectious diseases, we introduced a new module on the insect rabies-like brain-specific sigma virus system to study anti-viral resistance and host-parasite interactions. The virus, which has been found in African natural populations to infect both Drosophids and mosquitoes, can be easily detected through behavioural phenotyping, as well as with molecular methods. During this module, among other experiments, students performed collections of wild Drosophilids around the university and tested them for viral infection, finding similar infection rates to those reported in the literature in Dar es Salaam, a region that had not be previously evaluated. This powerfully illustrated how simple tools and fieldwork, can lead to new research venues.

To illustrate how *Drosophila* can be a useful model due to its evolutionary proximity to diseases vectors, we had a module on olfactory guided behaviours combining *Drosophila* and mosquitoes (*Aedes* and *Anopheles*). During this module, we taught how the latest advances in mosquito genetics, achieved thanks to the development of CRISPR/Cas9, combined with the accumulated knowledge of *Drosophila* neuroscience, makes it possible to directly study the molecular and genetic mechanisms that underlie their ability to find humans, and how this can help to design knowledge-driven strategies to control them. We performed behavioural experiments with multiple insect repellents, using wild-type *Drosophila* and locally caught mosquitoes, to determine which repellent is most effective and whether olfactory assays on insect repellents performed using *Drosophila* can be extrapolated to mosquitoes. This seemed to be the case - perhaps unsurprising given insect repellents often target conserved olfactory pathways. After analysing these results, the students then proceeded to perform similar experiments using genetically modified *Drosophila* were specific olfactory pathways were non-functional, to determine the pathways used to detect the different repellents. This module was instructive to show how using two different model organisms and by studying the nervous systems of insects, we can gain insights into important translational problems.

To show the power of *Drosophila* as a model to study general principles of nervous system function, we had a module on olfaction and a second module on taste, were participants were exposed to a multitude of genetic tools available in *Drosophila* to monitor and modify neuronal activity. They performed calcium imaging experiments, as well as optogenetic behavioural experiments.

Finally, to introduce students to the power of open source software and hardware to do science, we performed half of the practical modules, including the module on *Drosophila* as a model for human diseases, in an empty conference room where we brought simple home-built equipment for scientific research based on 3D printed parts and off the shelf electronics like microcontrollers or Raspberry Pi computers. The equipment included light/fluorescence microscopes (www.Open-Labware.net/FlyPi/), behavioural arenas for optogenetic experiments and low-cost electrophysiological setups. The aim of this approach was to vividly demonstrate that good science can be done in the complete absence of infrastructural support, provided one has the know-how of how to harness open hardware lab equipment plans from the internet and assemble them on site. We felt this approach was very successful based on informal conversations with the students, who remarked how this had been an eye-opener for them. In addition, almost half of the students deemed this the most instructive part of the course (see student's evaluation below).

As in previous years, we aimed at educating students beyond the subject matter, by introducing lectures and practicals on scientific writing, project creation and development, statistical analysis, bio-informatics, critical interpretation of data and effective usage of online resources to explore the possibilities of open source software and hardware. As part of this effort, we

introduced a new journal club session this year, in which every day students were divided in groups and rotated every day to a different member of the faculty. For an hour, students discussed in small groups either a scientific article previously selected by each faculty and that the students had to read, or they presented briefly their projects back home and received feedback on them.

The course ran 6 days a week over a period of 3 weeks. From Monday till Friday, each day consisted of morning theoretical lectures, where students were introduced to theoretical concepts in each of the subjects, and afternoon laboratory sessions, where students performed experiments in one of the subjects of the course, with a one hour after lunch journal club discussion as mentioned above. On each Saturday, students had to give an oral presentation on the work that they had performed during the week, in a conference format, and answer to the questions posed by students and faculty.

The first week consisted of a series of theoretical and practical sessions common to all of the students that introduced them to the field of insect neuroscience. The second and third weeks consisted of theoretical lectures common to all students and a series of alternative practical modules. Students had to choose one out of three practical modules running in parallel each week (for more details see the attached School program).

Week 1: **Introduction**

Insects as model organisms in neuroscience, introduction to genetics of *Drosophila* and neurogenetics, electrophysiology methods, introduction to bio-informatics, project creation and development, and scientific ethics.

Week 2:

Module A: Evolution and environmental control of body size and foraging behaviour.

Module B: *Drosophila* as a model for neuronal viral diseases and host-pathogen interactions

Module C: *Drosophila* as a model for human diseases.

Week 3:

Module A: Olfactory system – Central processing in *Drosophila*

Module B: Olfactory system – Receptors in *Drosophila* and *Anopheles*

Module C: Taste sensing and circuitry.

Contribution of the school towards scientific capacity building in the region and how it is benefiting the community at large.

This yearly school is helping to build a community of neuroscientists on the continent. This year we accepted 14 students from 10 different countries, and since the school's first edition in 2011 we have educated around 100 students from 15 different African countries. TReND students keep in contact through several communication channels, inspiring and helping one another, and many of them have now become themselves organisers of other schools. This is, in our view, the real measure of success. We will just give a few specific examples here.

An alumnus of the 2013 edition of this neuroscience school, Ibukun Akinrinade, organised this year a TReND course on molecular biology at her home university in Nigeria (http://nigmol2016.wixsite.com/nigmol2017). Ibukun managed to secure a PhD position at the IGC in Portugal after she attended the TReND neuroscience school and interacted with faculty of the course who worked there. Now, she decided to use all the knowledge she gained by giving back to her home university, and thus recruited faculty from the IGC to join her in teaching this very needed workshop at the University of Bingham in Nigeria. Another example is Samuel Faborode, a student of this year's neuroscience course also from Nigeria, he is now part of the organisers of the 2nd TReND school on Building your own equipment (http://trendinafrica.org/blog-posts/open-labware-ii-applications-open-now/). Finally, Ansa Cobham, alumnus of this course from the 2015 edition, was among the faculty in this year's

course. That alumni of this neuroscience school, become themselves teachers and organisers of scientific activities in the continent, shows the true domino effect that our course is achieving thanks to the way it is organised, and furthermore the follow up channels we put at the disposition of our alumni.

Furthermore, our TReND neuroscience school benefits the African population at large thanks to our outreach programme. TReND outreach programme was founded by an alumnus of the 2013 edition of this school, Mahmoud Maina, and it focuses on organising outreach events at public spaces and schools across the continent (http://preview.trendinafrica.org/our-projects/outreach/). To expand this programme, this year, as in previous years, Yunusa Garba, alumnus of the 2011 edition of this course, current co-organiser of the course since 2015 and member of the outreach team, gave a lecture on the activities carried out by TReND outreach team. This lecture inspired many to join the team, and organise outreach activities back at their home countries. In the past four years since its inception, this programme has educated over 2000 students and members of the public in 9 different African countries. This numbers powerfully show the amplifying effects that this neuroscience school is having, and only time will show how much further they can get with further support by organisations like The International Society of Neurochemestry.

Student's assessment of the course

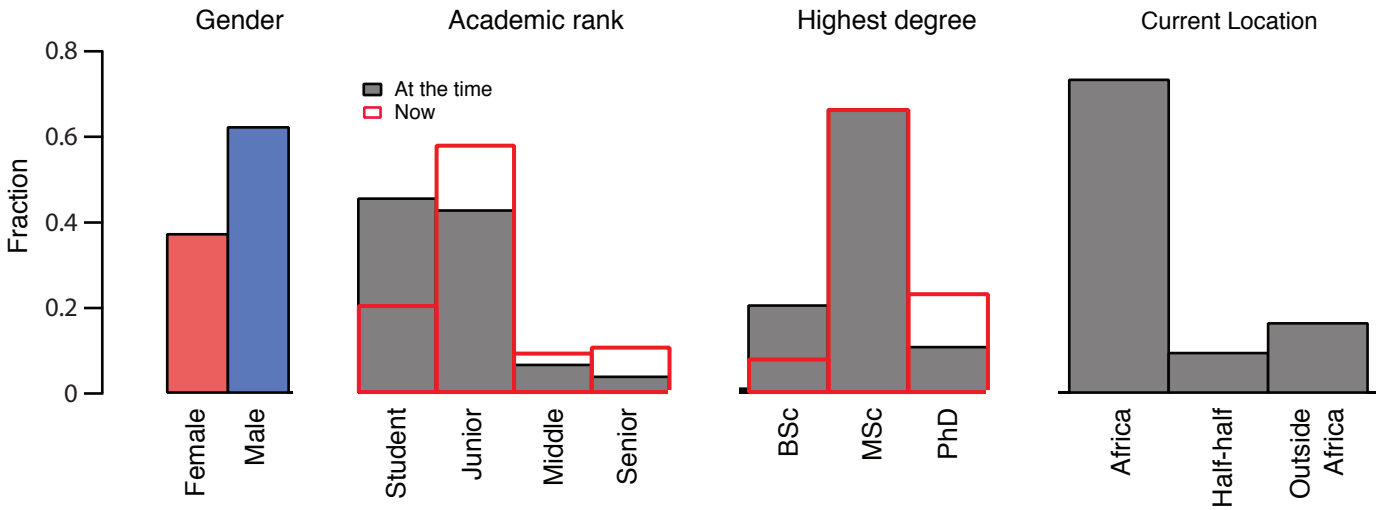
To assess the effectiveness of the course and to gather feedback suggestions for future improvements we asked students to fill out an online questionnaire. This year we decided to simplify the questionnaire, so that it would be faster for the students to fill it in. Of the 14 students of the course we received answers from 12. The feedback was overwhelmingly positive. When asked to rate the course from 1 (much worse) to 5 (much better) compared to other courses they had attended all of the students rated the course with either a 4 or 5 (66% rating it as 5). In order to gain an understanding of which activities and modules students found most useful, so we can expand those in future editions. We found that 91% of the students stated that the most useful activity were the afternoon practical sessions, which reaffirms our arguments to put particular emphasis on practical sessions, even though these can be more challenging to organise, particularly in low resource environments. As for topics, half of the students stated that the most useful were the specific modules of weeks 2 and 3 (50% of students), while 42% of students marked the introduction to open hardware approaches for science as the most useful topic of the course. When asked for their favourite module, most modules were favourited by at least one student, with the most popular being the advanced *Drosophila* genetics in the introductory week. When asked what can be improved the answers were varied but a recurring one was to expand on the module of *Drosophila* as a model for human diseases. The overwhelming positive feedback means that we should continue the course with a similar format in years to come with minor modifications, such as expansion on the topics requested by the students.

Long term assessment of course impact

Given the course has been running now for 6 consecutive years, and that we have plenty of success stories from our alumni, we wanted to perform a more systematic evaluation of the long term impact that this school has had on its alumni over the years. To that end we designed a simple on line questionnaire and sent it to the 92 alumni we have had over the past 5 years (the last school was on going when we circulated this questionnaire). We received responses from 75% of these. A summary of the responses can be found in the attachment. We first did a demographic analysis of our students. This showed that our male/female ratio is 60/40, still not the desirable 50/50 towards which we work, but close. Naturally students have progressed in the academic ranks with the years. Importantly, although 17% of our alumni are now outside Africa, the majority (83%) are either in Africa (74%) or spend half of their time at their home institution (9%). This means, that we are effectively supporting African researchers, without driving brain drain.

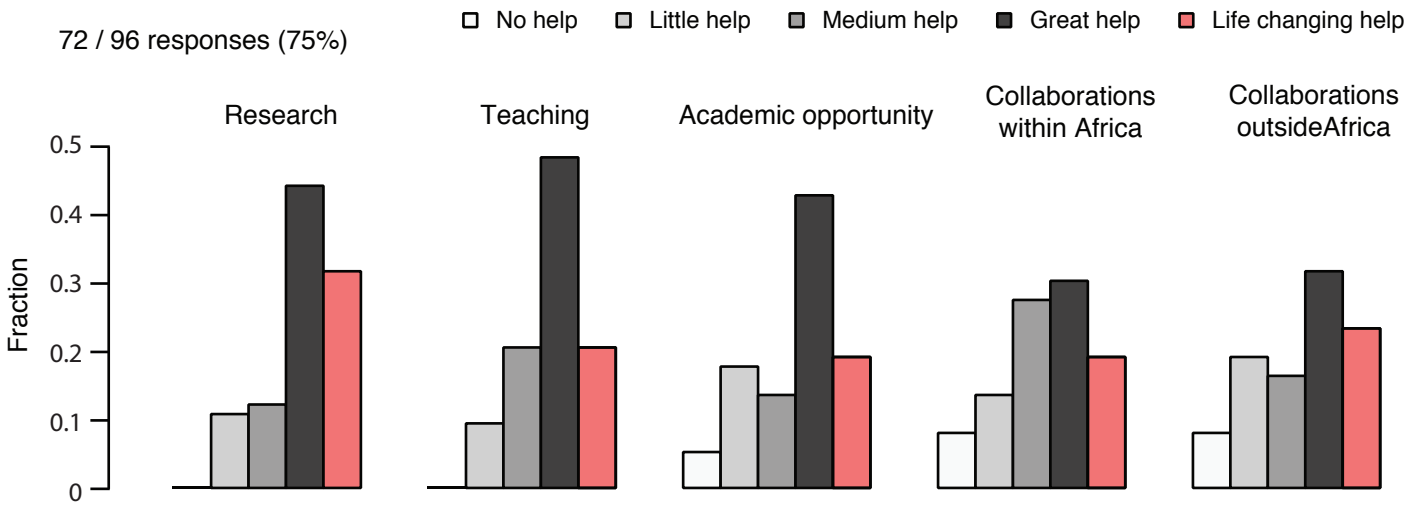
We next asked as series of questions to evaluate how helpful that the course has been for improving their: research activities, teaching activities, academic opportunities, collaborations within Africa and outside Africa. The scale went from "No help" till "Life changing help". For each of these categories at least half of the students evaluated the course as either "Great help" or "Life changing help". Importantly 32% of the students report that the course was life changing regarding their research activities, and another 44% reported "great help" in this category. We are extremely happy about these results, and we are hopeful regarding the evolution of our alumni in the years to come and the impact they can achieve collectively.

Demographics



Long term impact evaluation

72 / 96 responses (75%)



Pictures of the course can be found at:
https://www.flickr.com/photos/trendinafrica/albums/72157675292620042

List of Participants that received ISN funding

Given that ISN funding was used not only for travel scholarships but also to cover accomodation for all participants as well as to provide continous electricity for everyone and other general necessities for the successful outcome of the school, we consider that every participant received ISN funding
This is the list of all participants of the school

Organisers

Name	Academic affiliation	Country	Rank	Gender
Lucia Prieto Godino	University of Lausanne	Switzerland	Postdoctoral Researcher	Female
Thomas Baden	University of Tuebingen	Germany	Senior Lecturer	Male
Yunusa Garba	Gombe State University	Nigeria	Lecturer	Male
Sadiq Yusuf	Kampala International University	Uganda	Senior Lecturer	Male

Members of the faculty

Name	Academic affiliation		Rank	
Chuan Cao	University of Cambridge	UK	Postdoctoral Researcher	Femlae
Chris Elliot	University of York	UK	Lecturer	Male
Ansa Cobham	Monash University	Australia	PhD student	Female
Marta Rivera Alba	Janelia Research Campus	US	Postdoctoral Researcher	Female
Conor Mcmeniman	Johns Hopkins University	US	Principal Investigator	Male
Juan Snchez	University of Lausanne	Switzerland	Postdoctoral Researcher	Male
Sarah Carl	Friedrich Miescher Institute	Switzerland	Postdoctoral Researcher	Female
Georg Raiser	University of Konstanz	Germany	Postdoctoral Researcher	Male
Steve Rusell	University of Cambridge	UK	Principal Investigator	Male
Franne Kamhi	Macquarie University	Australia	Postdoctoral Researcher	Female
Horst Schneider	DAQ-Solutions	Germany	Staff Scientist	Male
Ihab Riad	University of Khartoum	Sudan	Senior Lecturer	Male

Students acepted in the course

Name	Academic affiliation		Rank	
Zoelisoa Rabeantoandro	University of Antanaviro	Madagascar	Lecturer	Female
Mayeso Gwedela	University of Malawi	Malawi	Lecturer	Female
Angela Danborno	Bingham University	Nigeria	Senior Lecturer	Female
Mosab Ali Awadelka	Al Neelain University	Sudan	Lecturer	Male
Jean Claude Rakotonirina	University of Antanaviro	Madagascar	Senior Lecturer	Male
Augustine Tandoh	Kwame Nkrumah University	Ghana	PhD student	Male
Oluwaseun Faborode	University of Ibadan	Nigeria	Lecturer	Male
Mireille Kameni	University of Yaoundee	Cameroon	PhD student	Female
Bwalya Chibwe	University of Lusaka	Zambia	PhD student	Female
Samson Slile	University of Addis Ababa	Ethiopia	PhD student	Male
Rashidatu Abdulazeez	Ahmadu Bello University	Nigeria	PhD student	Female
Olasupo Adeniyi	Kogi State University	Nigeria	Head of Department	Male
Monsurat Gbadamosi	Kampala International University	Uganda	Lecturer	Female
Latifa Mrisho	University of Dar es Salaam	Tanzania	PhD student	Female

Students attended the course as observers

Name	Academic affiliation		Rank	
Devarajan Dinsesh	IMTU	Tanzania	Lecturer	Male
Koneru Ratna Kumari	IMTU	Tanzania	Lecturer	Female

Disbursment of Funds

Funds from ISN	**Original currency**	**US dollars**
Flight ticket of Dr. Sarah Carl	1,058 CHF	1'052
Flight ticket of Dr. Lucia Prieto Godino	761 CHF	757
Flight ticket of Dr. Conor McMeniman	1,189 USD	1'189
Flight ticket of Dr. Tom Baden	779 Euro	827
Flight ticket for Dr. Ihab Riad	592 Euro	628
Flight ticket for Dr. Georg Raiser	812 Euro	863
Flight ticket for Dr. Juan Sanchez	928 Euro	986
Accomodation for 10 members of the faculty (49 USD night/person)	3,430 USD	3'430
Accomodation for 3 organisers (49 USD night/person)	3,087 USD	3'087
Refreshments during the course	181 USD	181
Total covered by ISN		**13'000**

Funds from IBRO		
Flight tickets for 3 students	2,119 Euro	2246
Accomodation for 13 students (49 USD night/person)	13,377 USD	13'377
Local ground transportation and to/from airport for faculty and students	1,370 USD	1'370
Equipment transport	246 USD	246
Flight ticket for 3 members of the faculty	2940 USD	2940
3D printer & Accessories	560 USD	560
Final dinner	550 USD	450
		21'189

Funds from The Company of Biologists		
Flight tickets of 10 students	6,000 GBP	7'489
		7'489

Funds from Janelia Farm		
Plane ticket of Marta Rivera Alba	1,300 USD	1'300
Backyard Brains amplifiers	1,177 USD	1'177
Accomodation Marta Rivera Alba	343 USD	343
		2'820

Funds from Cambridge in Africa		
Pre-paid extra luggage for transport	540 GBP	677
Molecular biology reagents & Fly reagents	500 GBP	630
Hardware & printer cost	426 GBP	535
Accomodation for 2 members of the faculty	686 USD	686
Flight ticket of Dr. Chuan Cao	800 Euro	847
Flight ticket of Dr. Chris Eliot	733 Euro	776
Sets of pipettes (TripleRed)	763 GBP	957
		5'354

Funds from TReND in Africa		
Consumables for lab practicals (reaction enzymes, antibodies, etc..)	estimated 2,000 USD	2'000
		2'000

6th IBRO-ISN TReND School on Insect Neuroscience and *Drosophila* neurogenetics

24th October (Monday)
09:00 - 09:20: Welcoming from Sadiq, Yunusa, Lucia & Tom
09:30 - 10:00: Student introductions (scientific speed dating)
10:00 - 10:30: Introduction to insects as model organisms (Tom & Sarah)
10:30 - 11:00: Coffee break /Photo taking
11:00 - 11:40: Introduction to molecular biology (Steve)
11:40 - 12:00: Social media as a science communication and information channel (Sarah)
12:00 - 14:00: Lunch

14:00 - 19:30:
Lab practicals on *Drosophila* as a model organism and bioinformatics tools (Steve/Sarah). Building electrophysiology amplifiers and EMG recordings (Tom/Horst/Ihab) (2 separate groups). This practical will run for 5 days, with student groups switching activities after 2.5 days.

25th October (Tuesday)
09:00 - 09:40: Drosophila genetics I (Sarah)
09:40 – 10:20: Introduction to neurophysiology (Tom)
10:20 - 11:00: Introduction to the physics of neural signals (Horst)
11:00 - 11:20: Coffee Break
11:20 – 12:30: Divide in 3 groups – Project discussions

14:00 - 19:30
Lab practicals as before

26th October (Wednesday)
09:00 - 09:40: Principles of biological membrane excitability (Horst)
09:40 – 10:20: Advanced Drosophila genetics I (Steve)
10:20 – 10:40: Introduction of Drosophila genetic tools to study the nervous system (Lucia)
10:40 - 11:20: Statistics (Sarah)
11:20 - 11:30: Coffee Break
11:30 – 12:30: Rotation of the 3 groups for project discussions

14:00 - 19:30
Lab practicals as before, student groups switch over at half-time.

27th October (Thursday)
09:00 - 09:40: Advanced Drosophila genetics II (Steve)
09:40 – 10:20: Introduction to genomics (Sarah)
10:20 - 11:00: Electrophysiological recording techniques (Horst)
11:00 - 11:20: Coffee Break
11:20 – 12:30: Rotation of the 3 groups for project discussions

14:00 - 19:30
Lab practicals as before

28th October (Friday)
09:00 - 09:40: Gene drive (Steve)
09:40 – 10:20: Open source (Tom and Ihab)
10:20 - 11:00: Tools and databases (Sarah)
11:00 - 11:10: Coffee Break
11:10 – 12:30: All together discussion GMO insects.

14:00 - 19:30
Lab practicals as before

29th October (Saturday)
09:30 – 10:30: Scientific grant writing (Sadiq)
10:30 - 12:30: Free time to do one to discussions with faculty about personal projects.
Afternoon: Free

30th October (Sunday)
Free

31st November (Monday)
09:00 - 09:40: Evolution and environmental control of body size and foraging behaviour in Drosophila larva (*Ansa)*
09:40 – 10:20: Drosophila as a model for neuronal viral diseases and host-pathogen interactions (Chuan)
10:20 - 11:00: *Drosophila* as a model for human diseases (Chris)
11:00 - 11:10: Coffee Break
11:10 – 12:30: Group presentation of individual projects

14:00 - 19:30
Module specific laboratory practicals. This week students choose one of the following:

1) *Drosophila as a model for human diseases* (Chris)
2) *Drosophila as a model for neuronal viral diseases and host-pathogen interactions (Chuan)*
3) *Evolution and environmental control of body size and foraging behaviour in Drosophila larva (Marta and Ansa)*

1st November (Tuesday)
09:00 - 09:40: Tracking methods for behavioural study of Drosophla larvae (Marta)
09:40 – 10:20: Drosophila as a model for neuronal viral diseases and host-pathogen interactions (Chuan)
10:20 - 11:00: *Drosophila* as a model for human diseases (Chris)
11:00 - 11:10: Coffee Break
11:10 – 12:30: Round table on developing a research project (all faculty)

14:00 - 19:30
Module specific laboratory practicals

2nd November (Wednesday)
09:00 - 09:40: *Drosophila* as a model for human diseases (Chris)
09:40 – 10:20: Drosophila as a model for neuronal viral diseases and host-pathogen interactions (Chuan)
10:20 - 11:00: Modelling the neural basis of Drosophila larvae behaviour (Marta)
11:00 - 11:10: Coffee Break
11:10 – 12:30: One to one project discussions with faculty

14:30 - 19:30
Module specific laboratory practicals

3rd November (Thursday)

09:00 - 09:40: *Drosophila* as a model for human diseases (Chris)
09:00 – 10:20: Drosophila as a model for neuronal viral diseases and host-pathogen interactions (Chuan)
10:20 - 11:00: *Drosophila* behaviour and biodiversity in Africa (Ansa)
11:00 - 11:10: Coffee Break
11:10 – 12:30: One to one project discussions with faculty

13:30 - 19:00
Module specific laboratory practicals

4th November (Friday)
09:00 - 09:40: *Drosophila* as a model for human diseases (Chris)
09:00 – 10:20: Drosophila as a model for neuronal viral diseases and host-pathogen interactions (Chuan)
10:20 - 11:00: *Drosophila* behaviour and biodiversity in Africa (Ansa)
11:00 - 11:10: Coffee Break
11:10 – 12:30: Time in module groups to prepare presentations.

13:30 - 19:00
Module specific laboratory practicals/ Preparation of presentations

5th November (Saturday)
09:00 - 11:00: Students presentations of practical projects

6th November (Sunday)
Free

7th November(Monday)
09:00 - 09:40: Introduction to olfaction in Drosophila (Lucia)
09:40 – 10:20: Taste perception in Drosophila (Juan)
10:20 - 10:40: Cofee break
10:40 - 11:20: Processing of olfactory information (Georg)
11:20 – 12:00: Neurobiology of ants (Franne)
12:00 – 13:00: One to one discussions with faculty about individual projects

14:30 - 19:00
Module specific laboratory practicals. This week students choose one of the following:

1- *Olfactory systems: Central processing* in *Drosophila* and *Apis* (Yunusa and Georg)
2- *Taste perception in Drosophila (Juan)*
3- *Olfactory systems: Receptors (mosquitoes and fruit flies) (Lucia and Conor)*
4- *Neurobiology in ants (Franne)*

8th November (Tuesday)
09:00 - 09:40: Gustatory second order neurones (Juan)
09:40 – 10:20: Introduction to mosquitoe chemosensory systems (Conor)
10:20 - 10:40: Cofee break
10:40 - 11:20: Processing of olfactory information (Georg)
11:20 – 12:00: Neurobiology of ants (Franne)
12:00 – 13:00: One to one discussions with faculty about individual projects

14:30 - 19:00: module specific laboratory practicals

9th November (Wednesday)
09:00 - 09:40: Neurobiology of ants (Franne)
09:40 – 10:20: Processing of olfactory information (Yunusa)
10:20 - 10:40: Cofee break
10:40 - 11:20: Integration of gustatory information (Juan)
11:20 – 12:00: Evolution of olfactory systems (Lucia)
12:00 – 13:00: One to one discussions with faculty about individual projects

14:30 - 19:00: module specific laboratory practicals

10th November (Thursday)
09:00 - 09:40: Neurobiology of ants (Franne)
09:40 – 10:20: Genome Editing Tools to Assess Olfactory Function (Conor)
10:20 - 10:40: Cofee break
10:40 - 11:20: Starvation in Drosophila (Juan)
11:20 – 12:00: Processing of olfactory information (Georg)
12:00 – 13:00: One to one discussions with faculty about individual projects

14:30 - 19:00: module specific laboratory practicals

11th November (Friday)
09:00 - 09:40: Neurobiology of ants (Franne)
09:40 – 10:20: Research talks (Lucia & Conor)
10:20 - 10:40: Cofee break
10:40 - 11:20: Research talk (Juan)
11:20 – 12:00: Processing of olfactory information (Georg)
12:00 – 13:00: One to one discussions with faculty about individual projects

14:30 - 19:00: module specific laboratory practicals

12th November (Saturday)
09:00 - 11:00: Student presentations
13:00 - 18:00: Goodbye party

Faculty
Tom Baden, School of Life Sciences, University of Sussex, UK
Horst Schneider, Beemedic, Germany
Sadiq Yusuf, IMTU, Dar es Salaam, Tanzania
Sarah Carl, Friedrich Miescher Institute for biomedical research, Basel, Switzerland.
Steve Russel, University of Cambridge, UK
Ihab Riad, Department of Physics, University of Khartoum, Sudan.
Chris Elliot, Department of Biology, University of York, UK
Chuan Cao, University of Cambridge,UK
Marta Rivera Alba, HHMI Janelia Farm Campus, USA
Ansa Cobman, Monach University, Melbourne, Australia
Yunusa M Garba, Department of Neurobiology, University of Konstanz, Germany
George Raiser, Department of Neurobiology, University of Konstanz, Germany
Juan Sanchez Alcañiz, CIG, University of Lausanne, Switzerland
Lucia Prieto Godino, CIG, University of Lausanne, Switzerland
Conor McMeniman, School of public health, Jonhs Hopkins University, US
Franne Kamhi, Macquarie University, Sydney, Australia

4th IBRO/ISN School on Insect Neuroscience and *Drosophila* Neurogenetics

IMTU, Dar es Salaam Campus, Tanzania

24th October – 6th Nov 2016

Apply now at www.TReNDinAfrica.org; **Deadline 17th July midnight GMT**

Aims and scope

To introduce the use of insects as powerful yet inexpensive model systems in neuroscientific research. With their comparatively simple nervous systems, tractable genetic access and low maintenance costs, *Drosophila* and other insects have rapidly consolidated their status as key model systems in scientific research.

Program and Modules of the Course

The course will be divided in three (3) weeks**.** The first week will be a general theoretical and practical introduction to the field. The second and third weeks will consist of theoretical lectures common to all students and a series of alternative practical modules. Students will choose one out of three practical modules running in parallel each week.

1. **Week 1 (24th-29th October)**
   Introduction *Insects as Model Organisms in Neuroscience, Introduction to Neurogenetics, Introduction to Bio-informatics, Electrophysiology methods, Statistics, Open Source and Scientific Ethics.*
2. **Week 2 (31st October -5th November)**
   Module A: *Drosophila as a model for neurological human diseases*
   Module B: *Drosophila* as a model for neuronal viral diseases and host-pathogen interactions
   Module C: *Evolution and environmental control of body size and foraging behaviour in Drosophila larva*
3. **Week 3 (7th -12th November)**
   Module A: *Olfactory systems: Central processing (bees and fruit flies).*
   Module B: *Taste perception in Drosophila*
   Module C: *Olfactory systems: Receptors (mosquitoes and fruit flies).*

Who should apply?

- All African scientists: Master students, PhD students, Postdoctoral Fellows, Group Leaders and Heads of Department
- Only applicants from African Institutions will be accepted
- Students will be selected on the basis of their academic record and written statements concerning their interest in neuroscience and how they expect to benefit from participating in the course
- There will be no attendance fee.
- There will be a number of grants for students coming from outside Dar es Salaam. The grants will cover round plane ticket from a major international airport and accommodation.

Faculty of the course

- **Tom Baden**, *School of Life Sciences, University of Sussex, UK*
- **Horst Schneider** *Innowep, Würzburg, Germany*
- **Sadiq Yusuf** *IMTU, Dar es Salaam, Tanzania*
- **Sarah Carl** *Friedrich Miescher Institute for biomedical research, Basel, Switzerland*.
- **Steve Russel** *University of Cambridge, UK*
- **Ihab Riad** *Department of Physics, University of Khartoum, Sudan*.
- **Chris Elliot**, *Department of Biology, University of York, UK*
- **Chuan Cao**, *University of Cambridge*
- **Marta Rivera Alba**, *HHMI Janelia Farm Campus, USA*
- **Christen Mirth**, *Monash University, Melbourne, Australia*
- **Yunusa M Garba**, *Department of Neurobiology, University of Konstanz, Germany*
- **Georg Raiser**, *Department of Neurobiology, University of Konstanz, Germany*
- **Lucia Prieto Godino**, *CIG, University of Lausanne, Switzerland*
- **Conor McMeniman**, *School of public health, Jonhs Hopkins University, US*

Organisers

- Dr. Laura Lucia Prieto Godino (CIG, Lausanne, Switzerland)
- Dr. Tom Baden (University of Sussex, Brighton, UK)
- Yunusa M Garba (University of Konstanz, Germany)
- Prof. Sadiq Yusuf (IMTU, Dar es Salaam, Tanzania

Sponsors