Content of the 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 and student’s feedback
- List with information on all participants including: name, academic affiliation and rank.
- Final programme summary
- 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
- List of names and photographs of students handed to students and faculty
- Booklet handed to students at the end of the course
- Poster used to announce the course
- One photograph of the entire group
- Extended data on students feedback

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

KIU, Dar es Salaam, Tanzania

Dates

17th August– 5th September 2015

Organisers

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

Countries represented by the students

Ghana, Sierra Leone, Kenya, Tanzania, Nigeria, Uganda, South Africa and Zambia

Faculty list

Dr. Tom Baden (CIN/BCCN, Tübingen, Germany)
Dr. Matthias Landgraf (Dept. Zoology, Cambridge, UK)
Dr. Chris Elliot (University of York, UK)
Dr. Jeremy Herren (icipe, Kenya)
Dr. Benajmin Matthews (Rockefeller University, New York, USA)
Dr. Laura Lucia Prieto Godino (CIG, Lausanne, Switzerland)
Dr. Horst Schneider (Innowep, Würzburg, Germany)
Prof. Sadiq Yusuf (KIU, Kampala, Uganda)
Dr. Marta Rivera Alba (HHMI Janelia Farm, USA)
Dr. Christen Mirth (Instituto Gulbenkian de ciencia, Portugal)
Dr. Georg Raiser (University of Konstanz, Germany)
Thomas Laudes (University of Konstanz, Germany)
Dr. Sarah Carl (Friederich Miescher Institute, Basel, Switzerland)
Olivia Schwartz (Friederich Miescher Institute, Basel, Switzerland)
Yunusa M Garba (Gombe State University, Nigeria)

Teaching assistant

Mwichie Namumbasa (University of Zambia, Zambia)
Rationale behind the school, activities carried out and basic schedule

The goal of the course was to promote state-of-the-art neuroscience research and education in low-resource environments through the use of insects as model organisms, combined with open source tools.

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. An illustration of the first point, how Drosophila can be a useful model thanks to the conservation of basic molecular mechanisms with mammals, we had a full module dedicated to the use of Drosophila as a model for neurodegenerative diseases, where students performed among other experiments, electrophysiology and behavioural assays in Drosophila strains that model important aspects of Parkinson’s diseases. To illustrate the second point, of how Drosophila can be an useful model thanks to its evolutionary proximity to diseases vectors, we had a full module focussed on mosquitoes (Aedes and Anopheles) and comparing its biology and genetic tools to those of Drosophila. 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.

In addition of teaching the technical specificities of each of the topics, 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. Particular emphasis was laid on introducing approaches that allow to perform science despite low economic resources.

To attain these goals we introduced the subjects not only theoretically but through practical laboratory sessions where students could learn to perform experiments themselves. We also put a lot of emphasis in students-faculty one to one interactions, in a way that students could easily consult with faculty members regarding their research projects back at their host institution, as well as their research interests at large. 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. 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 session 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. – Drosophila & Schistocerca (locust).

**Week 2:**

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

*Module B*: Function and Development of Motor and Mechanosensory systems. Drosophila

*Module C*: Taste sensing and circuitry. Drosophila

**Week 3:**

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


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

Importantly, the course was designed to promote active participation from the students, and therefore we encouraged that students interrupt during the theoretical lectures to ask questions, while during the
practical classes any given time we had a ratio of at least 1 faculty per 4 students, which meant that every student could be independently doing his/her experiments and collaborate with other students, while being closely supervised. As mentioned, at the end of each week students had to present their results from the laboratory experiments to the rest of the class in a scientific-conference format, which further increased interaction and discussions.

During the practical sessions we made a particular effort to expose the students to both state-of-the-art equipment as well as more cost-effective alternatives, critically comparing each method’s suitability to perform experiments at hand. If the more expensive option clearly yielded superior results, we encouraged students to consider the quality of data needed to satisfactorily address their scientific question. Moreover we attempted to reproduce selected findings published in top-ranked journals, demonstrating that often the same conclusions could have been drawn from a much more basic experiment. Additionally, in every practical module, we aimed at introducing a simple question of unknown results for the scientific community, motivating students at the prospect of making a small discovery within this newly learnt field.

Level of school and students
The students were African scientists of all levels from MSc to full professors, with the majority of the students being either post-docs or PhD students. The background of the students was very varied: Entomology, medicine, neuroanatomy, physiology and pharmacology.

It was an introductory school that aimed at teaching students that had never been exposed before to the field of insect neuroscience, but we aimed at achieving an advanced level in the concepts taught by gradually building up from basic concepts to the latest advances and techniques in the field.

Contribution of the school towards scientific capacity building in the region and how it is benefiting the community at large.
The school contributed to capacity building through two channels. First, we educated students from 8 different African countries, who after the school have gone back to their host institutions to pass newly learnt materials on to their peers. We have received numerous reports of our students giving seminars to their colleagues, for example, in one case, Ella Kasanga, a participant from Ghana, was so excited about this new field of research that she has joined another TReND course on the subject this year (http://fliact.org/welcomeghana). Also, this school has served to established connections among neuroscientists across the continent, and to solidify the basis for a group of insect neuroscientists: For example, our teaching assistant, Mwichie Namumbasa, was she our best student from last year’s course, she has set-up a Drosophila genetics teaching lab, where she is teaching the basics of Drosophila genetics to undergraduates at the Faculty of Natural sciences of the University of Zambia, Lusaka. In addition, Mwichie is also an alumni of TReND’s open hardware and 3D printing course (http://open-labware.net/education/), and she has set-up a 3D printing facility at her University that she is using to print at low cost, otherwise prohibitively expensive teaching and research materials. He attendance as teaching assistant to this years’ courses was extremely beneficial for all parts, she could learn new concepts by attending the lectures, and gain experience by helping in the organisation of the laboratory practicals, while the students benefiting from interacting with her, seeing her as a role model to follow, and having a local contact to discuss drosophila neuroscience research, open hardware and share knowledge and materials.

Second, through TReND in Africa (http://trendinafrica.org/activities/furnishing-african-labs/), we brought important equipment to Dar es Salaam, including a confocal microscope. All of this equipment has remained in Dar es Salaam, and will be used for next year’s course. Additionally, we have strengthened links between research institutions within Dar es Salaam, by linking the University of Dar es Salaam (where we did our 2014 course) with KIU, Dar es Salaam (location of our 2015 course). This type of trans-institutional collaboration within the region is rare, but very advantageous, and we are happy to catalyse this new dialog. It is our hope that the equipment we have donated to both of these institutions and the education we have imparted to researchers of both universities will provide the basis for the creation of a hub that any scientist in Tanzania can benefit from. Proof of principle that this model works is the Institute for Biomedical Research (IBR) at the Kampala International University branch in Ishaka, Uganda (http://shs.kiu.ac.ug/) which was created thanks to previous instalments of this school in Uganda. Today the IBR runs independently using the equipment we donated, supporting the research of more than 20 scientists, competitively winning international grants (e.g. an International Outreach Grant from the Wellcome Trust 2013), and publishing in international journals.

Additionally, the school benefited the local community by increasing the number of volunteers working for the outreach branch of TReND, which was founded by a group of alumni from previous years and it is devoted to organise outreach events at primary and secondary schools across the continent (http://trendinafrica.org/activities/outreach/).
**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 hosted by SALG (Student Assessment of Learning Gains, [http://www.salgsite.org/](http://www.salgsite.org/)). Here, we surveyed items ranging from individual teaching units to more general terms like class dynamics and time allocations for different course aspects. Out of the 17 students we received valid questionnaire responses from 13. The full SALG report is provided (see Extended data on student’s feedback files).

In short, feedback was overwhelmingly positive. Out of a total of 75 directly course related questions where 1 was extremely negative and 5 was extremely positive, the mean rating was 4.56 ± 0.33 (s.d.). These included questions about gains in understanding and attitude as well as course structure and overall organisation. For example, gains in understanding how and why to work with Drosophila as a model system, their basic genetics and the basics of concepts in neuroscience were all rated as 4.8. The lowest rating (3.8) was given for “gains in finding articles relevant to a particular problem in journals or elsewhere” – presumably as many students were already quite happy how to do that prior the course.

We also asked to rate the duration and difficulty of the classes on a scale of 1:5, with 3 being “just right” and 1 and 5 being too short or long, respectively. Students rated all 4 out of 5 questions pertaining duration [time for (i) entire course; (ii) lectures; (iii) lab-work; (iv) student presentations] as 2.1 (2 = “a little too short”) and the 5th one (time for in-class discussions) as 3.6 (4 = “a little too long”). Accordingly, while it will be difficult to further extend the 3-week course to even longer, as requested for most aspects of the course, we will in the future move some of the time allocated to in-class discussions to other activities. Regarding the level of the course, students rated Theoretical lectures and Practical exercises as 3.0 and 2.9, respectively (“just right”) but rated the level of chosen papers to read and discuss as 4.4 (4= a little too difficult, 5 = too difficult). Evidently there is need for further training to allow students to more comfortably keep up with state of the art developments in the field.

We also had free-text fields for students to express their views on a range of course-related topics (see Extended data on student’s feedback files). While it would be impossible to fairly summarise all comments here, the overall response was, as before, overwhelmingly positive. For example, one students commented “Great teachers, always willing to go the extra mile to help students understand”. Another student wrote: “The course opened my eyes about real science”.

**Pictures of the course can be found at:**
[https://www.flickr.com/photos/trendinafrica/albums/72157655172936284](https://www.flickr.com/photos/trendinafrica/albums/72157655172936284)
List of Participants that received ISN funding

Given that ISN funding was used not only for travel scholarships but also to cover accommodation for all participants as well as to provide continuous 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic affiliation</th>
<th>Country</th>
<th>Rank</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucia Prieto Godino</td>
<td>University of Lausanne</td>
<td>Switzerland</td>
<td>Postdoctoral Researcher</td>
<td>Female</td>
</tr>
<tr>
<td>Thomas Baden</td>
<td>University of Tuebingen</td>
<td>Germany</td>
<td>Postdoctoral Researcher</td>
<td>Male</td>
</tr>
<tr>
<td>Yunusa Garba</td>
<td>Gombe State University</td>
<td>Nigeria</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Sadiq Yusuf</td>
<td>Kampala International University</td>
<td>Uganda</td>
<td>Principal Investigator</td>
<td>Male</td>
</tr>
</tbody>
</table>

Members of the faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic affiliation</th>
<th>Country</th>
<th>Rank</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthias Landgraf</td>
<td>University of Cambridge</td>
<td>UK</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Chris Elliot</td>
<td>University of York</td>
<td>UK</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Christen Mirth</td>
<td>Instituto Gulbenkian de Cienca</td>
<td>Portugal</td>
<td>Principal Investigator</td>
<td>Female</td>
</tr>
<tr>
<td>Marta Rivera Alba</td>
<td>Janelia Research Campus</td>
<td>US</td>
<td>Postdoctoral Researcher</td>
<td>Female</td>
</tr>
<tr>
<td>Benjamin Matthews</td>
<td>Rockefeller University</td>
<td>US</td>
<td>Postdoctoral Researcher</td>
<td>Male</td>
</tr>
<tr>
<td>Olivia Schwartz</td>
<td>Friedrich Miescher Institute</td>
<td>Switzerland</td>
<td>PhD student</td>
<td>Female</td>
</tr>
<tr>
<td>Sarah Carl</td>
<td>Friedrich Miescher Institute</td>
<td>Switzerland</td>
<td>Postdoctoral Researcher</td>
<td>Female</td>
</tr>
<tr>
<td>Georg Raiser</td>
<td>University of Konstanz</td>
<td>Germany</td>
<td>PhD student</td>
<td>Male</td>
</tr>
<tr>
<td>Thomas Laudes</td>
<td>University of Konstanz</td>
<td>Germany</td>
<td>Research assistant</td>
<td>Male</td>
</tr>
<tr>
<td>Jeremy Herren</td>
<td>ICIPE</td>
<td>Kenya</td>
<td>Principal Investigator</td>
<td>Male</td>
</tr>
<tr>
<td>Horst Schneider</td>
<td>DAQ-Solutions</td>
<td>Germany</td>
<td>Staff Scientist</td>
<td>Male</td>
</tr>
</tbody>
</table>

Teaching assistants

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic affiliation</th>
<th>Rank</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mwichie Namumbasa</td>
<td>University of Zambia</td>
<td>Lecturer</td>
<td>Female</td>
</tr>
</tbody>
</table>

Students accepted in the course

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic affiliation</th>
<th>Country</th>
<th>Rank</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sadiq Garba</td>
<td>University of Maidaguri</td>
<td>Nigeria</td>
<td>Head of Department</td>
<td>Male</td>
</tr>
<tr>
<td>Fiona Nelima</td>
<td>University of Pretoria</td>
<td>South Africa</td>
<td>PhD student</td>
<td>Female</td>
</tr>
<tr>
<td>Onesimus Mahadi</td>
<td>Gombe State University</td>
<td>Nigeria</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Ella Kasanga</td>
<td>Kwame Nkrumah University of Science and Technology</td>
<td>Ghana</td>
<td>MSc student</td>
<td>Female</td>
</tr>
<tr>
<td>Mustapha Shehu</td>
<td>Gombe State University</td>
<td>Nigeria</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Nyakurz Ndaro</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Female</td>
</tr>
<tr>
<td>Isat Sherif</td>
<td>Ahmadu Bello University</td>
<td>Nigeria</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Farmanga Jaka</td>
<td>University of Sierra Leone</td>
<td>Sierra Leone</td>
<td>Medical Student</td>
<td>Male</td>
</tr>
<tr>
<td>Metson Hamuskwe</td>
<td>University of Zambia</td>
<td>Zambia</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Theophilous Kure</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Asha Lushino</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Female</td>
</tr>
<tr>
<td>Aidah Mooseke</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Female</td>
</tr>
<tr>
<td>Imaam Tamimi</td>
<td>University of Sheffield</td>
<td>UK</td>
<td>BSc student</td>
<td>Female</td>
</tr>
<tr>
<td>Keneth Kasozi</td>
<td>Kampala International University</td>
<td>Uganda</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
</tbody>
</table>

Students attended the course as observers

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic affiliation</th>
<th>Country</th>
<th>Rank</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manju Thomas</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Female</td>
</tr>
<tr>
<td>Neel</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
<tr>
<td>Ogah</td>
<td>Kampala International University</td>
<td>Tanzania</td>
<td>Lecturer</td>
<td>Male</td>
</tr>
</tbody>
</table>
Disbursement of Funds

Funds from ISN

<table>
<thead>
<tr>
<th>Airplane tickets of faculty and organisers</th>
<th>Original price</th>
<th>Price in US dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas Baden</td>
<td>700 Euro</td>
<td>784</td>
</tr>
<tr>
<td>Chris Elliot</td>
<td>451.63 GBP</td>
<td>636.66</td>
</tr>
<tr>
<td>Matthias Landgraf</td>
<td>797.49 GBP</td>
<td>1125.15</td>
</tr>
<tr>
<td>Horst Schneider</td>
<td>700 Euro</td>
<td>784</td>
</tr>
<tr>
<td>Tom Laudes</td>
<td>648 Euro</td>
<td>727</td>
</tr>
<tr>
<td>Mwichie Namumbasa</td>
<td>237 USD</td>
<td>237</td>
</tr>
<tr>
<td>Sarah Carl</td>
<td>1036 CHF</td>
<td>1066</td>
</tr>
<tr>
<td>Yunusa Garba</td>
<td>700 Euro</td>
<td>784</td>
</tr>
</tbody>
</table>

**Acomodation for students: Shemsi Hotel**
- 1 double room (Keneth Kasozi and Farmanga Jaka) 23 nights 50K shillings / night
  - 1'150'000 Tanzanian shillings 530
- 1 double room (Mustapha Shehu and Isa Sherif) 21 nights 50K shillings / night
  - 1'050'000 Tanzanian shillings 484
- 1 single room (Metson Hamusokwe) 23 nights 40K shillings / night
  - 920'000 Tanzanian Shillings 424
- 4 single rooms (Ella Kasanga, Fiona Nelima, Sadiq Garga) 21 nights, 40K shillings / night
  - 3'360'000 Tanzanian Shillings 1549

**Acomodation for faculty: Mara Courtyard Hotel**
- It excludes the nights paid by APS (detailed below)
- 76 nights in total room rate 35 USD / night (total 141 nights of which 65 covered by APS) 2218

**Other costs**
- 3 LED Torches
  - 32.97 USD 32.97
- 4 Arduino boards
  - 30.76 USD 30.76
- Independent power units (for unexpected multiple power cuts)
  - 1'200'000 Tanzanian Shillings 554
- Final dinner ceremony to hand diplomas
  - 12'500'000 Tanzanian Shillings 60
- Coffee breaks, snacks, coffee, tea and milk
  - 661'600 Tanzanian Shillings 305
- Ground transportation
  - 386'125 Tanzanian Shillings 178

**Total covered by ISN** 1259.54

Funds from The Company of Biologists
- Plane tickets for the 9 International participants (Imaam Tamimi was local, as she is from Dar es Salaam, currently based in the UK, she covered her airfare and stayed at her family house) 6000 GBP 9110

Funds from Janelia Farm
- Plane ticket of Marta Rivera Alba 1300 USD 1300
- Backyard Brains amplifier kits 626 Euro 700

**Total covered by Janelia Farm** 2000

Funds from American Physiological Society
- Lucia Prieto plane ticket 1596.45
- Chris Elliot plane ticket 685.48
- Christen Mirth plane ticket 1266.84
- Ben Mattews plane ticket 1286.8
- Jeremy Herren plane ticket 442
- Accommodation Lucia Prieto (24 nights X 35 US dollar/night) 840
- Accommodation Ben Matthews (7 nights X 35 US dollar/night) 245
- Accommodation Yunusa Garba (24 nights X 35 US dollar/night) 840
- Accommodation Jeremy Herren (3 nights X 35 US dollar /night) 105
- Accommodation Sarah Carl (7 nights X 35 US dollar /night) 245

**Total covered by APS** 7552.57

Funds from FMI, Basel
- Olivia Schwarz's plane ticket 995 CHF 1024

Funds from Kampala International University
- Lunch for all participants every day price not known
- Lecture and laboratory space at no cost price not known

Funds from TreND in Africa
- Consumables for lab practicals (reaction enzymes, antibodies, etc...) estimated 1500 USD
17th August-Monday
09:20- 09:45: Welcoming from Lucia
09:45- 10:00: Student introductions
10:00- 10:30: Introduction to insects as model organisms (Tom)
10:30- 11:00: Coffee break
11:00- 12:00: Introduction to Drosophila as a model organism (Sarah)
12:00- 12:30: Introduction to Twitter and social media (Sarah)
12:30- 14:00: Lunch
14:00- 19:30: Lab practicals. Lab practicals on Drosophila as a model organism and bioinformatics tools (Lucia/Sarah). Building electrophysiology amplifiers and EMG recordings (Tom/Horst/) (2 separate groups)

18th August- Tuesday
09:00-10:00: Gene cloning technology (Sarah)
10:00-11:00: Introduction to the physics of neural signals (Horst)
11:00-11:20: Coffee break
11:20-12:30: Introduction to neurophysiology (Tom)
14:20-19:20 p.m.
Lab practicals. Lab practicals on Drosophila as a model organism and bioinformatics tools (Lucia/Sarah). Building electrophysiology amplifiers and EMG recordings (Tom/Horst/) (2 separate groups)

19th August- Wednesday
09:00-10:00: Principles of biological membrane excitability (Horst)
10:00-11:00: Genetics of Drosophila I (Sarah)
11:00-11:20: Coffee break
11:20- 12:20: The functional organisation of the nervous system (Tom)
14:00-19:00 p.m.
Lab practicals. Lab practicals on Drosophila as a model organism and bioinformatics tools (Lucia/Sarah). Building electrophysiology amplifiers and EMG recordings (Tom/Horst/) (2 separate groups)
20th August- Thursday
9:00-10:00: Electrophysiological recording techniques (Horst)
10:00- 11:00: Genetics of *Drosophila* II (Sarah)
11:00-11:20: Coffee break
11:20- 12:30: Genetic tools in *Drosophila* for studying the nervous system (Lucia)

14:00-19:00 p.m.
Lab practicals. Lab practicals on *Drosophila* as a model organism and bioinformatics tools (Lucia/Sarah). Building electrophysiology amplifiers and EMG recordings (Tom/Horst/) (2 separate groups)

21st August- Friday
9:00-10:00: Introduction to the scientific method and statistics (Sarah)
10:00- 11:00: Insect endosymbiotic bacteria; from basic science to practical applications (Jeremy)
11:00-11:40: Coffee break and round questions with Jeremy
11:40- 12:30: Online resources: Pubmed, Flybase, Bloomington, etc… (Sarah)

13:30-19:00 p.m.
Lab practicals. Lab practicals on *Drosophila* as a model organism and bioinformatics tools (Lucia/Sarah). Building electrophysiology amplifiers and EMG recordings (Tom/Horst/) (2 separate groups)

24th August- Monday
9:00-10:00 : Evolution and environmental control of body size and foraging behaviour in *Drosophila* larva (*Marta / Christen*)
10:00-11:00 : Taste in *Drosophila* (Olivia)
11:00-11:20: coffee break
11:20-12:20: Function and Development of Motor and Mechanosensory systems. (Matthias)

14:00-19:30 p.m
Module specific laboratory practicals. This week students choose one of the following:
1- Evolution and environmental control of body size and foraging behaviour in *Drosophila* larva (Marta and Christen)
2- Taste in *Drosophila* (Olivia)
3- Function and Development of Motor and Mechanosensory systems (Matthias)

25th August-Tuesday
9:00 -10:00: Taste in *Drosophila* (Olivia)
10:00 -11:00 : Evolution and environmental control of body size and foraging behaviour in *Drosophila* larva (*Marta / Christen*)
11:00-11:20: coffee break
11:20-12:20: Function and Development of Motor and Mechanosensory systems. (Matthias)

14:00-19:30 p.m
Module specific laboratory practicals

26th August-Wednesday
9:00-10:00: Evolution and environmental control of body size and foraging behaviour in Drosophila larva (Marta / Christen)
10:00-11:00: Function and Development of Motor and Mechanosensory systems. (Matthias)
11:00-11:20: coffee break
11:20-12:20: Taste in Drosophila (Olivia)

13:30-19:00:
Module specific laboratory practicals

27th August-Thursday
9:00-10:00: Function and Development of Motor and Mechanosensory systems. (Matthias)
10:00-11:00: Taste in Drosophila (Olivia)
11-11:20: coffee break
11:20-12:20: Evolution and environmental control of body size and foraging behaviour in Drosophila larva (Marta / Christen)

13:30-19:00 p.m.
Module specific laboratory practicals

28th August-Friday
9:00-10:00: Taste in Drosophila (Olivia)
10-11: Function and Development of Motor and Mechanosensory systems. (Matthias)
11:00-11:20: coffee break
11:20-12:20: Evolution and environmental control of body size and foraging behaviour in Drosophila larva (Marta / Christen)

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

29th August- Saturday
9:00-13:00: Students presentations of practical projects

31st August-Monday
9:00-10:00: Introduction to Chemosensory systems (Lucia)
10:00-11:00: Drosophila as a model for human diseases (Chris)
11:00-11:20: coffee break
11:20-12:20: Processing of olfactory information (Tom / Georg)

13:30-19:00 p.m.
Module specific laboratory practicals. This week students choose one of the following:
   1- Processing of olfactory information in D.melanogaster (Tom and Georg)
   2- Drosophila as a model for human diseases (Chris)
   3- CRISPR-Cas9 technology for studying olfaction in mosquitoes and Drosophila (Lucia and Ben)

1st September-Tuesday
9:00-10:00: Drosophila as a model for human diseases (Chris)
10:00-11:00: Evolution of chemosensory systems (Lucia)
11:00 -11:20: coffee break
11:20-12:20: Processing of olfactory information (Tom / Georg)

13:30-19:00 p.m.
Module specific laboratory practicals

2nd September-Wednesday
9:00-10:00: Chemosensory system research in mosquitoes (Ben)
10:00-11:00: Processing of olfactory information (Tom / Georg)
11:00-11:20: coffee break
11:20-12:20: Drosophila as a model for human diseases (Chris)

13:30-19:00 p.m.
Module specific laboratory practicals

3rd September-Thursday
9:00-10:00: Processing of olfactory information (Tom and Georg)
10:00-11:00 Chemosensory system research in mosquitoes (Ben)
11-11:20: coffee break
11:20-12:20: Drosophila as a model for human diseases (Chris)

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

29th September-Friday
9:00-10:00 : Processing of olfactory information (Tom and Georg)
10:00-11:00 Chemosensory system research in mosquitoes (Ben)
11-11:20: coffee break
11:20-12:20: Drosophila as a model for human diseases (Chris)

13:30-18:30 p.m.
Module specific laboratory practicals/ Preparation of presentations

18:30- 20:00: Students presentations
20:00- 02:00: Goodbye diner and party!

Organizers
Dr. Lucia Prieto Godino (CIG, University of Lausanne, Switzerland)
Dr. Tom Baden (CIN/BCCN, Tübingen, Germany)
Prof. Sadiq Yusuf (Kampala International University, Uganda)

Teaching assistants
Yunusa Garba (Gombe State University, Nigeria)
Mwichie Namumbasa (University of Zambia, Zambia)

Faculty
Dr. Tom Baden (CIN/BCCN, Tübingen, Germany)
Dr. Matthias Landgraf (University of Cambridge, UK)
Dr. Chris Elliot (University of York, UK)
Dr. Lucia Prieto Godino (CIG, University of Lausanne, Switzerland)
Dr. Horst Schneider (DAQ-Solutions, Nehren, Germany)
Olivia Schwarz (FIM, Switzerland)
Prof. Sadiq Yusuf (Kampala International University, Uganda)
Dr. Marta Rivera Alba (Janelia Farm Research Campus, HHMI, USA)
Dr. Christen Mirth (Instituto Gulbenkian de ciencia, Portugal)
Dr. Sarah Carl (FMI, Switzerland)
Dr. Ben Matthews (Rockefeller University, USA)
Dr. Tom Laudes (University of Konstanz, Germany)
Dr. Georg Raiser (University of Konstanz, Germany)
STUDENTS 2015

Imaan Tamimi
Imaan
Tanzania / UK

Fiona Nelima Mumoki
Fiona
South Africa / Kenya

Garba Uthman Sadiq
Sadiq
Nigeria

Faramanga Jaka Ngobeh
Faramanga
Sierra Leone

Aidah Kiiza Musoke
Aidah
Tanzania / Uganda

Mustapha S Muhammad
Mustapha
Nigeria

G Theophilus Kureh
Theo
Tanzania / Nigeria

Isa Ahmed-Sherif
Sherif
Nigeria

Keneth Iceland Kasozi
Keneth
Uganda
STUDENTS 2015

Onesimus Mahdi
Onesimus
Nigeria

Ella A Kasanga
Ella
Ghana

Metson Hamusokwe
Metson
Zambia

Asha A Lushino
Asha
Tanzania

Nyakuru Ndaro
Nyakuru
Tanzania

L. Ittledu C.K.
Ittledu
Spain

G R Neel
Neel
Tanzania

G A Ogah
Ogah
Tanzania

Manju Thomas
Manju
Tanzania
5th TReND/ISN School on Insect Neuroscience and *Drosophila* Neurogenetics

Kampala International University (KIU)
Dar es Salaam campus, Tanzania

ORGANISERS

Lucia Prieto Godino
Tom Baden
Yunusa M Garba
Sadiq Yusuf
TReND in Africa gUG

FACULTY

Tom Baden (CIN/BCCN, Tübingen, Germany)
Sarah Carl (FMI Basel, Switzerland)
Chris Elliot (University of York, UK)
Jeremy Herren (icipe, Nairobi, Kenya)
Matthias Landgraf (University of Cambridge, UK)
Tom Laudes (University of Konstanz, Germany)
Ben Matthews (Rockefeller University, New York, USA)
Christen Mirth (Instituto Gulbenkian de Ciencia, Portugal)
Lucia Prieto Godino (CIG, Lausanne, Switzerland)
Georg Raiser (University of Konstanz, Germany)
Marta Rivera Alba (Instituto Gulbenkian de Ciencia, Portugal)
Horst Schneider (DAQ Solutions, Nehren, Germany)
Olivia Schwartz (FMI Basel, Switzerland)
Sadiq Yusuf (KIU, Bushenyi, Uganda)

TEACHING ASSISTANTS

Yunusa M Garba (Gombe State University, Nigeria)
Mwichie Nambusamba (University of Zambia, Zambia)

LOCAL ORGANISING COMMITTEE

Abanis Turyahebwa
Besigye Rowland
Michael Owiru
Ali, Rashid, Eryeza
Sensory computations in neuronal microcircuits
Tom studies how individual and small groups of neurons arranged into microcircuits break sensory patterns into parallel, highly specific representations of the outside world. Following his PhD on auditory processing by neurons of the cricket auditory pathway (lab of B. Hedwig, Dept. Zoology, Cambridge, UK) he studied visual processing by retinal bipolar cells in fish (lab of L. Lagnado, MRC-LMB, Cambridge, UK). His current research focuses on visual processing in the mice, with special focus on the principal neurons of the retina’s vertical pathway: Photoreceptors, bipolar cells and retinal ganglion cells. He uses a combination of 2-photon imaging of synthetic and genetically encoded calcium biosensors and patterned light stimulation to probe the visual processing of individual and networks of neurons in the isolated retina.

Selected publications:
Sarah Carl

Friedrich Miescher Institute (FMI)
Maulbeerstrasse 66
4058 Basel
Switzerland

Email: sarahhcarl@gmail.com

Transcription factors, epigenetics and gene regulation
Sarah obtained her B.A. from the University of Chicago, where she completed an honors thesis working on creating a Drosophila model for human neonatal diabetes in the lab of Martin Kreitman. Afterwards, she moved to the UK to do a 4-year Wellcome Trust Ph.D. programme in developmental biology at the University of Cambridge. She worked with Heliconius butterflies, Aedes mosquitos and Tribolium beetles during lab rotations for her M.Phil., but eventually came back to Drosophila, joining Steve Russell's lab for her Ph.D. There she was introduced to the world of genomics, studying comparative Sox transcription factor binding in four Drosophila species.

She is currently a post-doctoral fellow with the computational biology group at the FMI in Basel, where she collaborates with the labs of Helge Grosshans and Marc Buehler to study the roles of micro-RNAs and chromatin structure in gene regulation using a variety of genomic techniques. At the moment she works primarily with mice, yeast and C. elegans, but she still misses flies!

Key publications:
SY Park et al. (2014) Genetics; S Carl and Russell, SR (2015) BMC Genomics
Parkinson’s disease
My current research focuses on the physiology of fly models of Parkinson’s disease. My background is in the integrative action of amines in the nervous system, e.g. of octopamine in the snail feeding system, Despite the small size of the fruitfly, I have developed novel physiological techniques, to measure oviduct contraction, the force developed when a fly jumps, the strength and frequency of larval contractions, and the visual response. I have applied these to the parkin and LRRK2-G2019S models of PD, showing key neuronal deficits as a result of the high demand for energy in the CNS. The G2019S defects can be rescued by inhibitors targeted at the kinase of LRRK2 and by the drug UDCA (licensed for liver disease).

Key publications:

SSVEP technique

Output from SSVEP analysis of fly vision showing in vivo rescue of the hyperactivity by the kinase inhibitor BMPPB-32, specific to LRRK2
Jeremy Herren
Emerging Infections Disease Laboratory
International Centre for Insect Physiology and Ecology
Nariobi, Kenya, 00100.
jherren@icipe.org

Interactions between vector insects and endosymbiotic bacteria

Jeremy Herren’s research focus is the interaction between maternally transmitted endosymbiotic bacteria and their insect hosts. He carried out his PhD in the Lemaitre Lab (Drosophila immunity), where he utilized the powerful genetic tools available in Drosophila research to identify factors involved in endosymbiont transmission and regulation of proliferation. While in the Lemaitre lab, he developed the Drosophila-Spiroplasma system as a model endosymbiosis. After continuing Drosophila-Spiroplasma research for a short post-doc in Switzerland, he received funding from the Swiss National Science Foundation and the R. Geigy Foundation to move to the International Centre for Insect Physiology and Ecology (icipe) in Nairobi, Kenya to establish an independent line of research focused on the interactions between endosymbionts and disease vectors (see www.spirovector.is). His current research goals are centered on gaining a better understanding insect endosymbioses on a mechanistic and physiological level and exploring their potential use as a means to control insect-vector borne diseases.

Key publication:
Herren and Lemaitre, Cellular Microbiology, 2011; Herren et. al., mBio, 2013; Herren et. al., eLife 2014
I am interested in understanding how locomotor networks are specified and assembled. Working with the locomotor network of the *Drosophila* embryo and larva as a model we developed genetic tools to access identified sets of connecting nerve cells.

**Connectivity:** We discovered that the motor system has a straightforward organisational logic: motor neurons position their dendrites so that these form a neural map of the body wall musculature. Using serial transmission electron microscope reconstructions we are reconstructing the locomotor network. Experimentally, we are studying how these connections form in the CNS.

**Adjustment of connections – reactive oxygen species and homeostasis:** We previously discovered that neurons respond to changes in activity by adjusting their synaptic terminals, called ‘structural homeostasis’. We have now discovered a novel mechanism by which neurons use Reactive Oxygen Species (ROS) as a proxy for measuring their activity levels. ROS are by-products of mitochondrial ATP production, until now associated with ageing and neurodegenerative conditions. We are investigating the signalling pathways associated with ROS-mediated synapse regulation.

Tom Laudes

Universität Konstanz
Fachbereich Biologie
78457 Konstanz
Germany

tomlaudes@googlemail.com

More than apples and oranges

Tom studied Biology and Neurobiology in Tübingen and Magdeburg, respectively. For his diploma thesis he investigated the role of the neurotrophin BDNF in the thalamocortical network in mice. Using patch-clamp technique in whole cell mode he was able to show that synaptic transmission in the thalamus of mice was modulated by a reduction of BDNF.

In 2011 he moved to University of Konstanz to both study Mathematics and work with Prof. Dr. Giovanni Galizia and Dr. Daniel Muench. Using calcium imaging they explore the presentation of different odors on the antennae of Drosophila melanogaster. The main goal is to understand how mixtures and different temporal dynamics of odors are detected by olfactory receptor neurons. For a nice database please check: neuro.uni-konstanz.de/DoOR.

In 2014 they could even show that Drosophila melanogaster is able to distinguish between the smell of human cancer cells and healthy cells.

Key publications:
1) More than apples and oranges—Detecting cancer with a fruit fly's antenna; Scientific Reports 2014
2) Impaired transmission at corticothalamic excitatory inputs and intrathalamic GABAergic synapses in the ventrobasal thalamus of heterozygous BDNF knockout mice; Neuroscience 2012

Cancer odours exhibited a spatially broader and higher amplitude response than healthy control.
Genome engineering and chemosensation in mosquitoes

I am broadly interested in how genes and neural circuits regulate insect behavior, and in particular, in applying genetic and behavioral analyses to the study of disease vectors and agricultural pests. I obtained my Ph.D. in 2010 with Wes Grueber at Columbia University, studying the role of the alternatively spliced Ig-superfamily molecule Dscam1 in dendrite self-avoidance in Drosophila melanogaster larvae. I am currently investigating the genetics and neurobiology of egg-laying preference in the mosquito Aedes aegypti with Leslie Vosshall at Rockefeller University. Understanding how female mosquitoes evaluate and select egg-laying substrates will provide molecular targets for population control strategies of this deadly arboviral vector and insights into the regulation of innate behaviors by internal state and environment.

I currently develop and utilize methods for tracking multiple insects during behaviors such as free-flight, host-seeking, and egg-laying. To investigate the molecular basis of these behaviors, we use transcripome profiling of sensory tissues and genome editing with CRISPR-Cas9 to generate and study mutations in mechano- and chemo-receptors that are candidate sensors of osmolarity and other mosquito egg-laying cues. The development of genome engineering tools will allow for the study of behavior in non-traditional model organisms with important implications for public health and basic sciences.

| Aedes aegypti mosquito | Aedes aegypti pupae: wild-type and mutant |
Christen Mirth
Instituto Gulbenkian de Ciencia
Rua da Quinta Grande, 6
Oeiras, Portugal

Telephone: 351 21 446 4678
Email: christen@igc.gulbenkian.pt

The Development and Evolution of Environmentally-Sensitive Traits
Organisms in the wild live in highly variable and unpredictable environments, environments that interfere with and affect their development and behaviour. This variation in habitat forces developing organisms to make decisions about what to eat, where to live, and with whom to associate. Further, plasticity in foraging choice forms a template on which evolution can act to generate diversity in foraging preferences. Our studies focus on the regulation and evolution of body/organ size and foraging behaviour in species from the genus *Drosophila*.

We use the genetic tools available in *Drosophila melanogaster* to dissect how environmental signals, like nutrition, regulate body size, developmental timing and foraging choices. Further, we explore how manipulating the combination of macronutrients in the diet alters these characters. By analyzing the changes in optimal macronutrient space and foraging behaviour across species, we hope to identify how species-specific differences in foraging behaviour and adult body size evolves.

**Key publications:**

Larvae choose foods that do not produce optimal larval or adult fitness

![Image of larvae and macronutrient graph]
Lucia Prieto Godino

Center for Integrative Genomics
University of Lausanne
UNIL-Sorge, Batiment Genopode
CH-1015 Lausanne
Switzerland

Lucia.Prieto@cantab.net

Evolution of Olfactory Pathways
Lucia obtained her B.A. from the Universidad Autonoma de Madrid, where she did her research thesis on olfactory processing in flies in the lab of Gonzalo Garcia de Polavieja. After a summer working on vision evolution in box jellyfish in the lab of Dan Nilsson at Lund University, she joined Michael Bate's group at the University of Cambridge for her PhD. During her PhD she studied the embryonic development of the Drosophila olfactory system, receiving her PhD in 2011. She was awarded a FEBS long-term post-doctoral fellowship to join the lab of Richard Benton in CIG, Lausanne in March 2012 where she is studying the evolution of olfactory pathways using species of Drosophilids.

Key publications:

Recordings and backfilling of AC3 sensillum in D.Sechellia
I am studying the processing of olfactory stimuli in insect brains. Mainly, I am interested in the representation of temporally complex odor mixtures, simulating realistic odor stimuli how they would appear in the real world. To do this, I use mainly calcium imaging to record the activity of the individual cell types in the olfactory system of *Drosophila melanogaster*: Olfactory receptor neurons, Projection neurons and Kenyon cells of the Mushroom body. Additionally, I am performing electrophysiological recordings in the honey bee *Apis mellifera*.

For my PhD, I joined the Max-Planck graduate research school for Organismal Biology when I joined Giovanni Galizias lab in Konstanz. Before that, I studied biology at the Georg-August University of Göttingen, where I did my diploma studies on the mechanosensory bristles of *Drosophila melanogaster*. 

**Calcium imaging of *Drosophila melanogaster* Kenyon Cells in response to odor stimulating**
Evolution and Development of Behavior
I completed a 5-years Bachelor Degree (2001-2006) on Physics in Madrid (Spain). Right after, I did a Masters in Biophysics (2007) and a PhD also in Biophysics (2011) between Gonzalo G de Polavieja lab in Spain and Dmitri Chklovskii lab at JFRC (HHMI) in USA. At the beginning of 2012 I joined Christen's Mirth Lab at IGC, Portugal as a Postdoctoral Researcher. In parallel to my research on June 2013 I finished a Masters on Science Education at The National Distance Education University (UNED, Spain). On July 2013 I joined Kristin Branson Lab in JFRC (HHMI), USA, also as a Postdoctoral Researcher. I am interested in the evolution and development of foraging behavior in Drosophilids. Due to my background my approach is multidisciplinary, I combine biological, mathematical and computational techniques to generate and analyze large data sets. Currently, I am studying foraging behavior by automatically analyzing a large video collection of foraging larvae from 47 different species at 2 developmental stages. For that, in collaboration with Kristin Branson we developed automatic image analysis techniques like tracking (see image) or automatic behavior annotation (see reference) and original mathematical models. Also I am modeling nutrient-dependent larval growth in collaboration with Christen Mirth and Maria Carvalho.

Pharmacological and electrical stimulation of neural activity
I obtained my PhD in Neurophysiology in 1993 at the University of Gießen (Germany) and the Max-Planck-Institute of Brain Research in Frankfurt (Germany), investigating ON Bipolar cells in slices of the rat retina using electrophysiological techniques (Patch-clamp). I then moved to the Institute of Physiology, University of Marburg and worked on the question how signal substances of the immune system affect neuronal functions in the healthy brain. This research was done by investigating the effect of Interleukins on Long-Term-Potentiation (LTP) in the Hippocampus of freely moving rats and hippocampal slices using extracellular- and intracellular recording techniques. Since then I’ve worked in various labs on how the function of neurons in vertebrate brain are modulated by pharmacological and electrical stimuli. About three years ago I have left University and now work as a Research and Development Manager for a company (DAQ-Solutions, Nehren, Germany).

Key publications:
Schneider et al. (1998) PNAS; Boos et al. (1993) J Neurosci

Interleukin-1b gene expression during LTP in vivo.
Olivia Schwarz

Friedrich Miescher Institute for Biomedical Research
Maulbeerstrasse 66
CH-4058 Basel
Switzerland

olivia.schwarz@fmi.ch

Identification of the Taste Circuitry

I studied Biochemistry at the Swiss Federal Institute of Technology (ETH) in Zurich where I also did a Masters Degree in Neuroscience. I performed my research thesis in the lab of Martin Schwab focusing on spinal cord regeneration in mice. At the end of 2011 I started my PhD at the Friedrich Miescher Institute for Biomedical Research in Basel in the lab of Jan Pielage where I am interested in the adult taste circuitry of *Drosophila*.

The sense of taste is essential for the survival of most animals as it enables the discrimination between nutritious and harmful substances prior to ingestion. We are using the gustatory system as a model to study the principles underlying the development and function of a simple sensory-motor circuit. In adult Drosophila, attractive and aversive substances are detected by gustatory sensory neurons that relay taste information to the primary gustatory center, the subesophageal ganglion (SEG). Sweet stimuli evoke a robust and highly stereotypic motor behavior, the extension of the proboscis towards the food source.

My aim is to identify and characterize motoneurons and upstream regulatory interneurons that are necessary and sufficient for the execution of the motor program. The combination of opto- and thermogenetic tools with classical genetic approaches will allow us to unravel the principles underlying information processing, integration and computation of the taste circuitry.

The Proboscis Extension Response

A: stimulus  
B: lift rostrum  
C: extend haustellum  
D: extend labellum  
E: open labellum  
F: proboscis retraction
Iron deficiency and memory
Sadiq obtained his PhD in Physiology with a special focus on Gastroenterology from Ahmadu Bello University of Zaria in Nigeria, his research focused on elucidating the neural mechanism involved in gastric mucosa protection. He is now a professor and the head of the Faculty of Health Sciences and he teaches Physiology to medical Students at Kampala International University, Uganda.

The focus of his current research is to elucidate role of dietary iron in modulating the activity of neural networks during the process of learning and memory and to identify dietary precursors that can improve cognition or memory. This involves studying cellular mechanisms underlying functional configuration of neuronal networks and the mechanisms that are involved in the regulation of communication between cells e.g. by what extracellular information is the communication between neurons cells regulated, and by what mediators is it communicated in the cells.

Key publications:
STUDENTS 2015

Imaan Tamimi
Imaan
Tanzania / UK

Fiona Nelima Mumoki
Fiona
South Africa / Kenya

Garba Uthman Sadiq
Sadiq
Nigeria

Faramanga Jaka Ngobeh
Faramanga
Sierra Leone

Aidah Kiiza Musoke
Aidah
Tanzania / Uganda

Mustapha S Muhammad
Mustapha
Nigeria

G Theophilus Kureh
Theo
Tanzania / Nigeria

Isa Ahmed-Sherif
Sherif
Nigeria

Keneth Iceland Kasozi
Keneth
Uganda
STUDENTS 2015

Onesimus Mahdi
Onesimus
Nigeria

Ella A Kasanga
Ella
Ghana

Metson Hamusokwe
Metson
Zambia

Asha A Lushino
Asha
Tanzania

Nyakuru Ndaro
Nyakuru
Tanzania

Ragini
Ragini
Tanzania

G R Neel
Neel
Tanzania

G A Ogah
Ogah
Tanzania

Manju Thomas
Manju
Tanzania
Special thanks to:

Thomas Euler, Leon Lagnado, Richard Benton, Axel Borst, Stefan Pulver, Matthias Gerbering, Christine v Hertzberg, Jim Hasseloff, Stefan Pulver, Christopher Zaugg, Martine Trevisan, Christian Frankhausen, Katharina Anton-Erxleben, Wael Mohammed, Abdul Mohammed, Mike Bate, Patrick Meyer, Peter Parslow, Greg Gage, Timothy Marzullo, Janis Weeks, Giovanna Vinti, Kevin Rainey, Frances Jones, Pauline Essah, David Dunne, Jacqueline Dreyer, Kristin Branson, Christian Liebig; Jimena Berni, Arne Seitz, Giovanni Galizia, Isa Peset Martin, Fabiana Arieti, Marie Pertin, Jorge Castillo Quan, SDV Geis Suisse,

and many more...
The Company of Biologists is a UK based charity and not-for-profit publisher run by biologists for biologists. The Company aims to promote research and study across all branches of biology through the publication of its five journals.

**Development**
Advances in developmental biology and stem cells dev.biologists.org

**Journal of Cell Science**
The science of cells jcs.biologists.org

**The Journal of Experimental Biology**
At the forefront of comparative physiology and integrative biology jeb.biologists.org

**OPEN ACCESS**
Disease Models & Mechanisms
Basic research with translational impact dmm.biologists.org

**Biology Open**
Facilitating rapid peer review for accessible research bio.biologists.org

In addition to publishing, The Company makes an important contribution to the scientific community, providing grants, travelling fellowships and sponsorship to noteworthy scientists, meetings, societies and collaborative projects around the world. The Company also runs a series of transdisciplinary workshops.

For subscriptions and consortia sales email sales@biologists.com

Recommend a subscription by completing our library recommendation form http://biologists.com/downloads/Library.pdf

For more information please visit our website biologists.com
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. We will explore questions on basic research in neuroscience as well as research with important applications, such as mosquito genetics or how Drosophila can be used as a model for human diseases. For example, combining the knowledge we have on Drosophila neurogenetics with research in mosquito biology is a powerful strategy to understand the molecular and neural basis of their devastating host seeking behaviour, and how this can help to design knowledge-driven strategies to control it. This course aims to introduce key concepts in insect genetics and neuroscience to scientists at African institutions to promote the use of such model systems in their research. Subjects covered will range from lab maintenance and grant writing to state of the art neurogenetics, behavioural and electrophysiological research techniques.

Who should apply?
• All African scientists: Master students, PhD students, Postdoctoral Fellows, Group Leaders and Heads of Department
• The course is intensive, running 6 days a week from 9am in the morning to 8pm in the evening, and requires strong involvement, motivation and drive to learn from the students.
• 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.

Program and faculty 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.

Organisers
Dr. Laura Lucia Prieto Godino (CIG, Lausanne, Switzerland)
Dr. Tom Baden (CIN/BCCN, Tübingen, Germany)
Yunusa M Garba (Gombe State University, Nigeria)
Prof. Sadiq Yusuf (KIU, Bushenyi, Uganda)