

Bioinformatics Course Held in Uganda

Organizing and delivering a course on the molecular cell biology and bioinformatics of two important African pathogens, *Plasmodium* (malaria) and *Trypanosoma* (sleeping sickness), kept the authors—ASCB members Keith Gull, Oxford, UK, and Dick McIntosh, University



A practical session on the use of bioinformatic software. Left to right: Tamirat Gebru (Ethiopia), Sarah Nanyiti (Uganda), Emmanuel Ogbadoyi (Nigeria), and postdoctoral instructor Eva Gluenz from Switzerland and the UK

of Colorado—busy last July. We were joined by colleagues Luc Vanhamme, IBMM, Gosselies, Belgium, and George Lubega, Kampala, Uganda. These four scientists are currently supported by a grant from Human Frontiers in Science Program, which covered the majority of the course's costs. ASCB, backed by the Carnegie Foundation, plus the Wellcome Trust and the Society for General

Microbiology (UK), added support to help cover travel and living costs for some of the students; 25 young Africans came to the course from eight sub-Saharan countries. Course participants were selected from more than 250 applicants from 15 African countries, reflecting the intense interest in this kind of offering among young biologists.

The course was organized from Gull's lab in the Dunn School of Pathology. Three experienced and energetic postdoctoral research fellows there—Bill Wickstead, Eva Gluenz, and Catarina Gadelha—ranked the many applicants on the basis of their background, evidence of relevant experience, and their need for the training. The result was a diverse and talented pool of students, nine females and 16 males. The students brought tremendous energy and interest to the course.

Much of the organization for the course onsite was done by George Lubega, working from the School of Veterinary Medicine at

Makerere University. He studies *T. brucei*, the cause of Nagana, which is the animal equivalent of sleeping sickness. Lubega also selected several African colleagues to contribute special lectures: John Enyaru (LIRI, Tororo, Uganda) spoke on the incidence of sleeping sickness in Uganda; Enock Matovu (Makerere) discussed drug resistance; and Tom Egwang (Med Biotech Laboratories, Kampala) spoke about the biology of malaria. Gull had also invited lectures from Peter Bull of the Medical Research Institute in Kenya and Pierrick Uzuereu from the IBMM in Belgium. So the assembled expertise provided an informed and balanced account of the biology and medicine of these wily protozoan parasites and their insect vectors (mosquitoes for *Plasmodium* and Tsetse flies for *Trypanosoma*).

Facilitating Discovery

The course was based on a mixture of lectures about cellular and organismic biology, seminars on bioinformatic principles and their application in current research, and computer exercises developed by the research fellows in Gull's lab. In this way, the students were introduced to some of the major bioinformatic tools. They came from Uganda, Kenya, South Africa, Mali, Nigeria, Cameroon, Malawi, and Ethiopia. They were able to access the Internet, using one PC for every two students; communication bandwidth was sufficient to download sequences and programs as necessary.

Since genomic information on *Plasmodium* and *Trypanosoma* is now available, the tools and principles of bioinformatics are having an important impact on drug and vaccine research. They are also adding to the growth of knowledge about the biology of these parasites. There is great interest among African scientists in modern parasitological research, so this course gave

timely training in relevant techniques and applications in a context that should facilitate discovery biology in these important diseases. Indeed, bioinformatics may be particularly useful in Africa, where it is difficult to carry out

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expensive, wet-bench science. Careful planning of experiments is an absolute must, and the thoughtful use of genomic information can certainly point molecular cell biology in useful directions.

Deepening Knowledge

One strategy of our course was to balance background biology about each of these protozoa with post-genomic methodologies that are currently being used to deepen our knowledge of pathogen biology and host-pathogen interactions. Some of our students were professional in the study of *Plasmodium* but knew little about *Trypanosoma*; others vice versa. Thus, some lectures were designed to bring everyone closer to a common level of knowledge, so the afternoon and evening “practical” courses could be understood in the context of each disease organism. Computer training provided hands-on experience in sequence analysis, data base searching, examination of unknowns, and searching for motifs. Most examples were taken from current research in the Gull lab at Oxford, but a few students brought sequences from their own research to interrogate and analyze with the tools available at the course.

Furthering Networking

One collateral benefit of the course was the contacts that African students made with one another. A group from Nairobi, Kenya, was particularly active in this sphere. They had already established a local network of interested young biologists, providing web-based tools for their communication. Conversations near the end of the course suggested that this net would be expanded to include young scientists from many of the countries represented at the course. Indeed, a questionnaire that was circulated as we finished gave opportunities for open-ended feedback, and one of the most praised features of the course was the opportunity for improved networking among Africans. Other featured aspects were the balance of lectures and practical experiences and the sustained opportunity for conversation with course faculty.

The students’ comments, both written and oral, made it plain that this sort of course is a

welcomed opportunity for African biologists. Most of the numerical ratings of course components, like lectures and exercises, were excellent; and most of the suggestions for improvement included comments like: “Do this twice a year;” “Make the course longer;” “Add time for students to work on their own projects;” and “Include more information about post-genomic research.” These responses suggest that similar courses would be constructive activities for other members of ASCB who might have an interest in assembling a teaching effort in a developing nation.

Supporting Future Courses

Such courses are expensive, given the costs of travel, of accommodations that Europeans and Americans will find satisfactory, of renting computers or other equipment, and of setting up suitable teaching space including web access. However, several granting agencies have strong interests in supporting efforts of this kind. The International Affairs Committee of the ASCB is committed to facilitating such pedagogic efforts by members of the Society.

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Pictured: All the students and teachers involved in the July 2006 Kampala course, except the leader, Keith Gull, who was taking the photo; Dick McIntosh is third from left.

We who organized this course are convinced that it was a worthwhile use of our time and money. We hope that others will find ways in which they can assemble the resources to put on courses of their own choice and design. The interest in such offerings is likely to be very high, and the return on the investment is likely to be great, both in terms of knowledge transferred and connections made. ■

—Keith Gull and Dick McIntosh