

AFRICA

Danes Bring DNA Analysis To the Heart of Africa

African biologists have long struggled to study their wealth of wildlife without DNA tools. Now funding from Denmark has created a state-of-the-art lab

KAMPALA, UGANDA—Population geneticist Peter Arctander has long provided an unofficial DNA analysis service for colleagues in Africa. Researchers, mostly from Uganda where Arctander has strong links, would ship their samples to his lab at the University of Copenhagen and, if the tissue reached Denmark in good condition—not always the case—the analysis would come back several weeks later by mail. Arctander has been providing this service because many African researchers have had nowhere else to turn: Not a single university lab in sub-Saharan Africa, outside South Africa, has had modern DNA technology. Now, that's about to change.

Last month, Makerere University here in Uganda's capital opened its new Molecular Biology Lab, the first university center to provide a full complement of facilities for molecular biology, including polymerase chain reaction (PCR), cloning, and DNA sequencing. "This lab is a gold mine, because many excellent local students with an interest in wildlife are ready to jump at the opportunity of applying DNA technology," says population geneticist Michael Bruford of the University of Cardiff in the United Kingdom, who has extensive experience in building research capacity in developing countries.

Lab director Silvester Nyakaana, a population geneticist, says the facility will initially focus on studies of the phylogeny and population genetics of large African mammals. Researchers will use PCR to pull out and amplify highly variable genetic markers, which they will sequence to yield information on genetic divergence and the relationships between population groups. "Genetic studies carried out now are our last chance to gain a deep insight into how groups of large mammals organize and spread over time," says Arctander, who studies the molecular evolution and population genetics of herbivores. "Africa is the only place where such groups still exist, and their distribution and genetic purity are being disturbed at a fast pace."

The Kampala lab is the product of a 6-year effort by Arctander and Panta Kasoma,

director of Makerere's Institute for Environment and Natural Resources (MUIENR). Arctander's research has taken him to Africa many times over the past 8 years, and he visited MUIENR frequently, learning firsthand the frustrations of trying to conduct genetic studies without adequate facilities. He and Kasoma drew up a plan to establish a DNA facility at Makerere, and Arctander took the idea to a Danish government development program called ENRECA, Enhancement of Research Capacity in Devel-



Work in progress. Makerere's "cowshed" under construction.

oping Countries. ENRECA came through with a 9-year grant of \$1.7 million, and the project was in business.

Arctander began by training a group of young Ugandan scientists at his Copenhagen lab in the application of DNA technology, while a building on the Makerere campus commonly known as the cowshed was converted into a state-of-the-art genetics lab. This compact yellow bungalow now contains brightly lit labs and storerooms, decked out with sleek modern machinery and inviting Danish-designed lab furniture—a stark contrast to the dark and decades-old wood-paneled teaching labs found elsewhere on the campus. The ENRECA funding will also pay the first 3 years of salaries for the lab's initial staff of 10 scientists, students, and technicians.

It has not all been plain sailing, however. Even after the official opening, workers were still installing an elaborate system of generators to protect against frequent power failures. "After a week of trying, we are still waiting for electrical adapters for the equipment, and we have come to realize that even a piece of

plastic tubing cannot just be borrowed from a neighboring lab," says Pia Friis, Arctander's research assistant. And the local bureaucracy can be trying. Imports tend to get stuck in the airport for weeks to months, as happened with the lab's new vehicle for fieldwork.

The lab's newly trained researchers are now itching to get to work. Biologist Josephina Birungi plans to study speciation within groups of antelopes by comparing selected mitochondrial DNA sequences. Initial studies suggest that these data could challenge the current species definition within this animal group, because the traditional morphologically based boundaries between species, subspecies, and populations are blurred. Meanwhile, graduate student Vincent Muwanika is preparing to analyze the speciation of the warthog, which has never been studied genetically. "My studies should solve the long-standing argument as to whether warthogs are divided into subspecies," says Muwanika, who also hopes to answer the question of whether a population

of warthogs recently identified in Kenya belongs to a species believed to be extinct.

The Makerere researchers also hope to put their skills to work in conservation efforts, such as helping guide the relocation of animals. Although conservation sometimes makes moving populations of animals desirable, geographically distant groups may have evolved and adapted to different environments in ways that make them less compatible with each other, even though

they may appear morphologically similar. "The only way to avoid the detrimental effects of mixing different subspecies is to look at genetic elements," says Nyakaana, who conducted an extensive characterization of the genetic divergence between elephant populations in Uganda, which he carried out while visiting Arctander's lab.

Kasoma hopes to attract foreign investigators and collaborators to the institute to help create an intellectual center of excellence. Arctander adds that part of the motivation for the project was "making it possible for scientists worldwide to study African subjects in Africa, so that the data can be recorded and put to use here." Visiting investigators may also provide an important source of support when the funding from ENRECA runs out in 3 years' time. So far, Nyakaana says researchers from surrounding countries as well as from Europe and the United States have expressed interest: "There is a deep-felt need for genetic information in relation to research originating in Africa, and we intend to fill the gap."

—LONE FRANK

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