NEWS IN FOCUS

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Ethnic groups in Africa, including San communities in Botswana, are working with scientists to unravel early human history on the continent.

GENETICS

Rare DNA sequences bring early human history to light

Genome studies unlock clues to our ancient family tree and migration patterns in Africa.

BY AMY MAXMEN

Humanity's early history in Africa is coming into sharper focus with a recentstudy of 180 genomes from a dozen ethnic groups on the continent — some of which have never before been analysed.

These preliminary results suggest that more than 40,000 years ago, two of the groups — the San and the Baka Pygmy — were roughly twice the size of other ethnic groups present at the time, and that the San and Baka overlapped in central-eastern or southern Africa. Researchers presented these as-yet unpublished results at an American Society of Human Genetics (ASHG) meeting in San Diego, California, in mid-October.

This is the most comprehensive whole-genome-sequencing study of groups that represent the ancestral diversity of humans, says Sarah Tishkoff, a human geneticist at the University of Pennsylvania in Philadelphia, who co-led the project. Together with genetic analyses of ancient human remains from Africa published last year[1,2], the latest data are starting to fill in the nearly blank canvas of early human history.

Although *Homo sapiens* originated in Africa roughly 250,000 to 315,000 years ago, geneticists have devoted their attention almost exclusively to the small subset of Africans that migrated ▶

north to Europe tens of thousands of years later. A handful of African genomics projects are now beginning to address this imbalance.

In 2009, Tishkoff and her colleagues published a study[3] assessing small sections of the genome from people belonging to about 100 of the more than 2,000 ethnic groups in Africa today. The results suggested that the San and the Baka might have descended from a single lineage of hunter-gatherers.

But Tishkoff needed whole genomes from them and other ethnic groups to test this idea. Her team spent years getting approvals for the project from government and institutional ethical review boards in countries in eastern, southern and western Africa. Tishkoff and her colleagues partnered with local researchers and spoke about genetics with the communities that they hoped to enrol in the project, explaining what the scientists and the groups could learn about their early ancestry. Many of the communities live in remote regions — such as the Sabue people of southwestern Ethiopia — and geneticists know little about them.

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Genomics research in Africa can be contentious, and many scientists engage in such outreach to involve the communities they work with in their research. The Human Heredity and Health in Africa (H3Africa) Initiative — an African-led consortium that supports genomics research — has called for a greater role for Africa-based scientists in such projects. And last year, an Indigenous group in South Africa introduced research-ethics guidelines for scientists looking to work with them.

Tishkoff and her colleagues make sure to follow up with the communities that participate in their studies. For example, some of the Fulani, a traditionally nomadic group, are interested in what their genetics can reveal about their migration history, says Alfred Njamnshi, a neurologist at the University of Yaoundé in Cameroon.

ANCESTRAL LINKS

Nearly one-fifth of the genetic variation that the team uncovered has never before been reported. Statistical models of the data indicate that the Hadza and the Sandawe people of Tanzania shared an ancestor in the past 30,000 years. The findings also suggest that there was intermingling during that period between the Hadza, the San in southern Africa and the Baka in central Africa, all of whom were traditionally hunter-gatherers. "I think we are seeing an ancient common ancestry between the major hunter-gatherer groups in Africa," Tishkoff says.

Some of the findings align with signals of mixed Hadza and San ancestry in DNA extracted from human remains[1] dated to between 2,500 and 8,100 years old, says Pontus Skoglund, a palaeogeneticist at the Francis Crick Institute in London.

Other researchers want to see further statistical analyses of the data before they accept the idea that the Hadza, San and Baka overlapped geographically. Earlier studies have given little indication that people from these groups mixed with each other, says Deepti Gurdasani, a genetic epidemiologist at the Wellcome Sanger Institute in Hinxton, UK. But it's plausible, she adds. "There is literally nothing in Africa that is not possible since we have no idea what humans were doing on the continent 5,000 years ago."

This knowledge gap might dissipate in the coming years as more teams working on African genome projects publish their results. Gurdasani presented findings from an analysis of whole genomes from 2,000 Ugandans at the ASHG meeting. And H3Africa has sequenced more than 400 genomes from African individuals, says Charles Rotimi, a Nigerian genetic epidemiologist at the National Human Genome Research Institute in Bethesda, Maryland, who founded the initiative.

After conducting further analyses, Tishkoff plans to publish the results and share the anonymized genomes publicly, so that scientists can pool their data.

This last bit is essential, says Shaohua Fan, a molecular biologist at Fudan University in Shanghai, China. As of 2016, about 80% of people in genetic studies were of European descent. "We know humans originate in Africa," says Fan, "but we don't know what we did before we left — we don't know our own history." ■

1. Skoglund, P. *et al. Cell* **171**, 59–71 (2017).
2. Schlebusch, C. M. *et al. Science* **358**, 652–655 (2017).
3. Tishkoff, S. A. *et al. Science* **324**, 1035–1044 (2009).

PHYSICS

Quantum projects get cash

European Commission has announced the first-round winners of its new flagship.

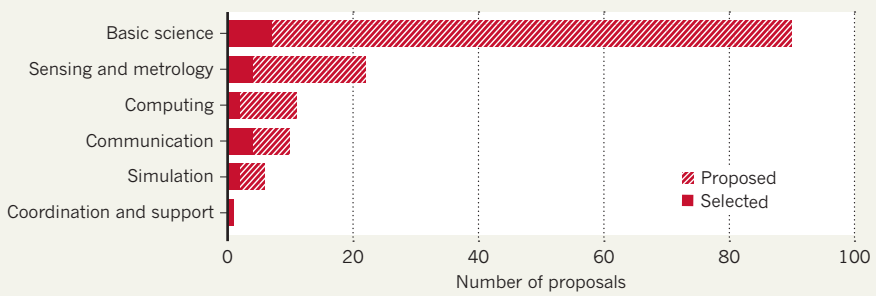
BY DAVIDE CASTELVECCHI

Plans to build two working quantum computers are among the first winners to be announced in a €1-billion (US$1.1 billion) funding initiative of the European Commission. On 29 October, the commission announced the first batch of fund recipients of its Quantum Flagship. The 20 international consortia, including public research institutions and industry, will receive a total of €132 million over 3 years for technology-demonstration projects (see 'Quantum windfall').

The efforts add to a global rush to turn early-stage laboratory experiments into applications such as practical quantum computers, which promise to improve certain tasks — for example, predicting chemical reactions exponentially faster than classical computers do. Most recently, in August, Germany's federal government quietly announced a quantum initiative worth €650 million. The US Congress is considering a proposal to set aside more than $1.2 billion for quantum computing, and China, which has already made major investments in

QUANTUM WINDFALL

Europe's Quantum Flagship programme will spend €132 million (US$150 million) overall on 20 projects spanning 6 themes for its first 3 years.



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