

► or closer relative in its database. Searches of 30 randomly selected GEDmatch profiles found a similar rate of relative matching.

But such databases could identify many more people who aren't in them. DeAngelo was not on GEDmatch; detectives found him using profiles of his third cousins. Erlich's team estimates that a database containing genetic profiles of 3 million Americans of European descent could enable the identification of 90% of this demographic using public genealogy records. GEDmatch is growing by 1,000–2,000 profiles per day, says co-administrator Curtis Rogers, and should hit 3 million in the next few years.

To see whether they could track down people not in the database, the researchers attempted to identify an anonymous woman from Utah who had made her DNA public as part of the 1000 Genomes project. They uploaded her profile to GEDmatch and searched for distant cousins. Of the people who had enough DNA in common with her to suggest that they shared an ancestor in the past few generations, two also had enough public genealogical information to narrow the search. After a day spent ruling out hundreds of descendants, the team identified the Utah woman. (She is not named in the paper and the researchers made no attempt to contact her.)

SPOTTING INFORMATION

DeAngelo was identified only because crime-scene DNA had been preserved. This allowed forensic scientists to apply the approach now used in consumer genetics testing and many

biomedical studies: sequencing hundreds of thousands of DNA variants, or single-nucleotide polymorphisms (SNPs), across the genome.

For the past few decades, by contrast, most crime-scene DNA has been analysed using the sequences of more than a dozen 'short tandem repeats'. The FBI's Combined DNA Index System (CODIS) holds more than 13 million such profiles. These allow forensic scientists to determine an individual's genetic signature, but are poorly suited to matching relatives, says Noah Rosenberg, a population geneticist at Stanford

The team identified an anonymous woman who had made her DNA public.

University in California. To circumvent this, Rosenberg's team developed a computational method to cross-match CODIS profiles with a close relative's SNP profile. Simulations suggested that about one-third of people genotyped using short tandem repeats could be correctly matched to a first-degree relative genotyped with SNPs². This could allow investigators who are unable to generate SNP profiles from crime-scene material to look for matches to CODIS profiles in databases such as GEDmatch, and vice versa, Rosenberg says.

Forensic genealogical investigations similar to the Golden State Killer case are set to grow. The lack of regulation for such searches is striking, says Rori Rohlf, a statistical geneticist at San Francisco State University in California. However, some rules do exist: in California, for

example, law-enforcement forensic databases can be used to find relatives only in cases of serious crimes where there is a risk to public safety, and the genealogical investigative team must be distinct from local detectives on a case.

Erlich says that consumer genetics companies could include digital signatures with the data files people can download, allowing GEDmatch to differentiate them from crime-scene profiles uploaded by investigators, and shield consumers from searches. Rogers says that GEDmatch has no plans to limit law-enforcement access — after the Golden State Killer case emerged, the site updated its terms of service to explicitly warn users that investigators could use it — and he worries that regulating use will interfere with the site's purpose: helping people find relatives. "I don't think anyone's privacy is being violated," he says. "People should be able to control their own DNA and not the government."

Colleen Fitzpatrick, co-executive director of the DNA Doe Project in Sebastopol, California, which has used familial searching to help solve a number of missing-person cases, says the information gleaned from these searches isn't so different from other leads — and therefore shouldn't be treated differently. "Just about anything we do in life reveals information about others," she says. ■

1. Erlich, Y., Shor, T., Pe'er, I. & Carmi, S. *Science* <https://doi.org/10.1126/science.aau4832> (2018).
2. Kim, J., Edge, M. D., Algee-Hewitt, B. F. B., Li, J. Z. & Rosenberg, N. A. *Cell* <https://doi.org/10.1016/j.cell.2018.09.008> (2018).

FUNDING

Argentina's scientists struggle as peso slips

Inflation and currency devaluation have hobbled research.

BY MICHELE CATANZARO

Juan Pablo Paz's plans for a new cold-atom laboratory have slowly eroded over the past two years. Paz, a physicist at the University of Buenos Aires, won a US\$1.1-million grant in February 2017 to set up the facility. But the money, awarded by the Inter-American Development Bank, was transferred to Paz through an Argentinian government agency that paid him in pesos.

As Argentina's currency weakened, so did Paz's buying power. When the physicist won his grant, \$1 cost 16 pesos. "Now it costs 38," he says. "By the time I got the money, I was able to buy just a part of the equipment"

Paz, who is looking for money to cover the last 40% of his lab's start-up costs, is one

of many researchers who say that Argentina's worsening financial woes are hurting their research. The slipping peso makes it harder to purchase equipment from abroad, while rapidly increasing inflation has crushed scientists' budgets and salaries at home.

Researchers have also struggled under austerity measures adopted by the government in 2014 and intensified in June by a financing agreement that Argentina signed with the International Monetary Fund.

"The science and technology system of Argentina is collapsing," a group of high-profile scientists, including Paz, wrote in an open letter published late last month. More than 1,000 foreign scholars or Argentinian scientists working abroad — including several Nobel laureates — have endorsed the message.

Argentina's total science spending increased tenfold between 2003 and 2015, reaching the equivalent of \$3.96 billion. Along the way, in 2007, the country established a dedicated science ministry. Still, Argentina spends much less of its gross domestic product (GDP) on research than does South America's leader, Brazil. The slice of GDP that Argentina devotes to science peaked at 0.63% in 2012, when Brazil spent 1.13%.

And recent years have seen a reversal in fortune for research overall. The government's science outlay fell by almost 40% between 2015 and 2018 when measured in US dollars, and the share of Argentina's budget devoted to research has fallen from 1.69% in 2008 to 1.23% in 2017. The picture is set to grow grimmer next year: the budget proposed by Argentina's president, Mauricio Macri, includes further cuts to science.

PINCHED PURSE

The government's belt-tightening has drastically reduced the average value of awards made by ANPCyT, Argentina's main granting agency for science and technology. The country has also suspended its contributions to several international research projects.

The situation is also dire at CONICET, Argentina's national research council. The council, whose budget stood at \$681 million



A professor teaches students in Buenos Aires during a protest for better wages and funding.

EITAN ABRAMOVICH/
APP/GETTY

last year, is now spending 90% of its money on salaries and scholarships, leaving little for research, says Fernando Stefani, a physicist at the University of Buenos Aires. "There are research centres that cannot pay for illumination or gas. Their lab rats and cell lines are

dying," he says. "It's a dramatic situation."

Scientists also complain of delays in payments from CONICET and ANPCyT. "We are in October, and we have been transferred less than 40% of our annual budget," says Andrea Gamarnik, a virologist at the Leloir Institute, a

life-sciences research centre in Buenos Aires.

Officials with the government say they hope to ease the pain, but keeping up with the peso's slide has been difficult. "We were not able to change the budget immediately," says Jorge Aguado, secretary of planning and policy at Argentina's science secretariat. "We understand the concerns, but we are committed to extend the budget, in order to maintain projects and purchases."

Mario Albornoz, coordinator of the Ibero-american Network of Science and Technology Indicators (RICYT), says the situation in Argentina is part of a broader trend. "Almost all Latin American countries, including Brazil and Mexico, are cutting their science budgets, for macroeconomic reasons," says Albornoz, whose group tracks statistics related to research in the Americas. "This government has made many mistakes, but it's not true that it wants to destroy science."

But that does not satisfy many researchers, who see science as vital to Argentina's future. "What will we live off in 30 years?" says Stefani. "Past-century technology and agricultural activities will not be enough." ■

INDONESIA

Clash over tsunami access

Scientists say red tape imposed by Indonesian government is delaying research.

BY QUIRIN SCHIERMEIER

Two weeks after an earthquake and subsequent tsunami killed more than 2,000 people on the Indonesian island of Sulawesi, some foreign researchers say that red tape is slowing down or preventing investigative work of the devastated coastlines. But the Indonesian government says that it has sped up the time it takes to process permits for researchers in the wake of the tsunami, and that the requirements it imposes on international researchers have been in place for years.

"It is absolutely important for us to go to the field to survey the correct locations," says tsunami researcher Philip Liu, vice-president for research and technology at the National University of Singapore. "But when I asked for a permit, I understood that it might take months." As a result, Liu decided not to research the area after all.

Meanwhile, an international reconnaissance team led by Costas Synolakis, a tsunami researcher at the University of Southern California in Los Angeles, had rushed to Singapore a week after the tsunami hit, hoping to get to Indonesia. But the researchers learnt that they must submit detailed survey plans and research proposals that include local collaborators. They

say this rule was not enforced before, and fear that it might delay the planned survey by several weeks, time they can ill afford. "Disaster surveys need to mobilize in the first few days after the disaster, before the data needed to better understand the event is permanently eradicated," says Synolakis. The Sulawesi events are of particular

interest to scientists in Southern California and the Mediterranean, where active tectonic faults close to the coast could likewise trigger unpredictably large tsunamis, says Synolakis, who is still in Singapore awaiting his research permit, although some of his team have returned home.

But Sadjuga, the head of the team at the ▶



International researchers are waiting to be granted access to study the aftermath of the tsunami.

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