

► From a group of ten people randomly selected from HLI's database, the approach correctly identified an individual 74% of the time. The findings, according to the paper, suggest that law-enforcement agencies, scientists and others who handle human genomes should protect the data carefully to prevent people from being identified by their DNA alone. "A core belief from the HLI researchers is that there is now no such thing as true deidentification and full privacy in publicly accessible databases," HLI said in a statement.

But other geneticists, having studied the paper, say that in their opinion, the claim is vastly overblown. "I don't think this paper raises those risks, because they haven't demonstrated any ability to individuate this person from DNA," says Mark Shriver, an anthropologist at Pennsylvania State University in University Park. In a randomly selected group of ten people — especially one chosen from a data set as small and diverse as HLI's — knowing age, sex and race alone rules out most of the individuals, he says.

To demonstrate this, computational biologist Yaniv Erlich at Columbia University in New York City looked at the age, sex and ethnicity data from HLI's paper. In a study published on 7 September on the preprint server bioRxiv, he calculated that knowing only those three traits was sufficient to identify an individual out of a group of ten people in the HLI data set 75% of the time (Y. Erlich Preprint at bioRxiv <http://doi.org/ccxp;2017>). Erlich contends that there was no need to know anything about the people's genomes. Furthermore, he says, HLI's reconstructions of facial structure from SNPs are not highly specific — they tend to look as much like an individual as

anyone of that person's sex and race.

Before it was published in *PNAS*, the paper had been submitted to *Science*, says Shriver, who reviewed the paper for that journal. He says that HLI's actual data are sound, and he is impressed with the group's novel method of determining age by sequencing the ends of chromosomes, which shorten over time. But he says that the study doesn't demonstrate that individuals can be identified by their DNA, as it claims to. "I think it totally misrepresents what they did and what they found," he says.

HLI said that its paper states that using multiple parameters, of which a person's face is only one, to identify someone is possible based on work with more than 1,000 genomes. "It heralds that prediction will become increasingly precise," says Heather Kowalski, an HLI spokesperson. HLI stated that it stands by its methodology and acknowledged that the sample set was small. It added that "the HLI team is working on rebuttal to criticisms by Yaniv in BioRxiv [*sic*]"

Shriver says that he and Erlich pointed out their concerns to the study authors in their reviews of the paper for *Science*. Both Shriver and Erlich say that the journal ultimately rejected the paper. (*Science* does not comment on unpublished studies.) The study was then submitted to *PNAS* under an option that allows a member of the US National Academies of Science, Engineering, and Medicine, such as Venter, to choose the reviewers. Two of them are information-privacy experts and

the remaining reviewer is a bioethicist. *PNAS* confirmed that Venter chose all three reviewers for the study. HLI declined to comment on the *PNAS* review process for the paper.

Jason Piper, a computational biologist and a paper co-author who now works at Apple in Singapore, agrees that the study misrepresents the findings. Piper adds that his contract with HLI waived his right to approve the manuscript before it was submitted, allowing the company to present his data as it saw fit. HLI responded by saying that "authors were given an opportunity to review and comment on the paper".

Piper has since criticized the study heavily on Twitter and says that, in his opinion, HLI has a potential conflict of interest in encouraging restricted access to DNA databases. HLI, a for-profit company, hopes to build the world's largest database of human genetic information.

"I think genetic privacy is very important, but the approach being taken is the wrong one," Piper says. It would be more useful to find a way to make genomic data public without allowing individuals to be identified, he says.

The company responded to criticisms of the paper by saying that "HLI stands by the protection of genome data and the promotion of modern solutions for data exchange". It added that the study was intended to spur discussion about how to share genetic information while protecting a person's privacy.

Still, Erlich is concerned that Venter's stature gives the paper extra weight in the eyes of policymakers, who may become overly concerned about DNA privacy. "New rules and regulations are based on papers like that," he says. "It's important when we deal with privacy risks to get the facts right." ■

## POLICY

# Researchers riled by lack of detail in Brexit science plans

*UK government document fails to extinguish concerns over funding and migration.*

BY DANIEL CRESSEY

More than one year after UK citizens voted to leave the European Union, and close to three months into 'Brexit' negotiations, the British government has finally laid out how it would like to handle scientific relationships with the EU after it leaves the bloc in 2019. Many scientists are less than impressed.

In a document released on 6 September, the UK government pledges to "seek an ambitious

science and innovation agreement" in Brexit negotiations with the EU. But it simply sets out areas in which agreement will be sought, rather than making any specific proposals.

John Womersley, director-general of the European Spallation Source, a research facility in Lund, Sweden, says that although the aspirations in the document are welcome, the lack of detail means it will probably disappoint the scientific community more than reassure it. "I downloaded the document and I thought, hoped, expected, it would be too big for me to

digest in ten minutes. It was trivially easy to digest in ten minutes," he says.

Mike Galsworthy, of the Scientists for EU pressure group, says that the document makes "generally warm and happy noises" but contains nothing really new. "My anxiety is, specifically, we could have told you all of this two years ago," he says of its contents. "We have now wasted a quarter of the negotiation time and the government hasn't really put forward anything that really addresses the hard challenges."

## BIOMEDICINE

# Scientists target embryo limits

South Korean researchers look to work on human cells.

BY MARK ZASTROW

More than a decade after a fraud scandal in stem-cell science rocked South Korea, scientists in the field are ramping up pressure on the government to relax the country's strict regulations on human-embryo research — which many researchers say is tantamount to a ban.

On 30 August, the nation's bioethics committee held a public forum with the Ministry of Health and Welfare in Seoul, inviting researchers and scholars to discuss possible changes to the country's bioethics policies for research.

"We need to revise the relevant laws and institutions urgently," Jin-Soo Kim, a genome engineer at the Institute for Basic Science in Daejeon, South Korea, said at the forum. He points out that the regulations were made before the advent of gene-editing tools such as CRISPR-Cas9. In South Korea, such tools cannot be used in human embryos.

Some bioethicists are warning against changing the law without public consultation. Before the forum, local media reported that a separate, government-convened panel of researchers, ethicists and religious scholars was on the verge of recommending that the government lift its restrictions on human-embryo research. But the health ministry's bioethics division told *Nature's* news team that there is no plan to revise the current regulations.

In 2005, South Korea restricted research on human embryos to scientists who are granted a licence from the national bioethics committee. A team led by Woo Suk Hwang, then at Seoul National University, was initially the only one granted approval. In 2006, investigators determined that Hwang had fabricated some results and he was later convicted of embezzlement and bioethics violations.

Approvals for new research effectively ceased, say researchers. Since then, only one team — led by Dong Ryul Lee, a developmental biologist at CHA University in Seoul — has received a licence for embryonic-stem-cell projects. Lee says he must do much of his work abroad. In South Korea, his team can use only surplus eggs from *in vitro* fertilization; these are not ideal because they have been frozen.

It could take years to change the regulations, says Kim, but "it seems that the public hearing is a step forward for a long journey." ■



David Davis (left) is negotiating Britain's exit from the European Union.

In January, the government listed science as one of its 12 priorities for Brexit negotiations, but it has said little about what this would mean in practice. UK institutions currently receive around €1 billion (US\$1.2 billion) in funding every year from EU programmes, mainly from the huge Horizon 2020 funding programme, the latest of the EU's research-funding 'Framework Programmes' (see 'British bonanza'). Freedom-of-movement rules have allowed academic staff — currently more than 30,000 — from other EU countries to move to UK universities and live and work without visas.

The document — one of a series outlining the government's position in negotiations with the EU — confirms that the United Kingdom would like to remain party to Horizon 2020 and any successor schemes. It would "welcome discussion" about continued UK participation in these, as well as in research-and-development programmes relating to space, nuclear energy and defence.

But it warns that any payments that the United Kingdom would have to make to remain involved in such projects would be weighed "against other spending priorities". It also says that, although EU citizens will lose the automatic right to come and work

in the United Kingdom, the country "will continue to welcome the brightest and best".

## OVER THE HORIZON

Ministers have previously declined to say whether they would seek to keep the United Kingdom in EU schemes such as Horizon 2020. How much Britain might have to pay if it were to join a successor to Horizon 2020 would have to be negotiated. Several non-EU countries have joined the Framework Programme as 'associated countries'. That allows their researchers to apply for grants, but it also involves the nations paying a proportion of the programme's budget, based on a ratio of their gross domestic product to the EU's. On the basis of those rules, Britain might expect to pay between £1.8 billion and £2 billion to rejoin the scheme.

Edward Whiting, director of policy at the Wellcome Trust in London, praises the plans for addressing the ability of researchers to move to the United Kingdom, but he says it will be important for the government to think beyond researchers with established careers when they look for the "brightest and best". Younger researchers and support staff are also crucial to science, he points out, and these scientists may fall foul of immigration controls, such as the need to earn above a certain salary.

To attract the "brightest and best", Britain is touting a new £100-million 'Rutherford Fund', which will provide fellowships for researchers to move to the country. But James Wilsdon, who studies research policy at the University of Sheffield, notes that the current EU system allows, for example, an Italian scientist with a grant from the European Research Council to move to Britain with her grant, her partner and her children. Allowing a researcher to come to the United Kingdom is not enough, he says, if that person's family would have to be left behind.

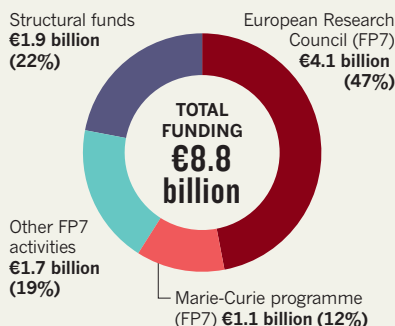
"The upside of the European system in mobility terms is clearly that it's very flexible in terms of movement of you and your partner and your kids," says Wilsdon. "Scientists are not these people who only sit there doing science. This is real life." ■

FRANCOIS LENOIR/REUTERS

SOURCE: EUROPEAN COMMISSION

## BRITISH BONANZA

The EU spent €8.8 billion on UK-based research, development and innovation between 2007 and 2013 — mostly through its last Framework Programme, FP7.



**CORRECTION**

The News story 'Researchers riled by lack of detail in Brexit science plans' (*Nature* **549**, 140–141; 2017) erroneously stated that the United Kingdom would leave the European Union next year. In fact, it is expected to leave in 2019.