

► barely a year ago and announced its list of candidates on 11 May, just a month before the first round of the general election. Half of its candidates were women, and a majority had no previous political experience.

LREM's new deputies include Villani, who won more than 69% of votes in his constituency, Saclay, in Sunday's run-off. Saclay is home to a cluster of research institutions that is among the largest in the country.

WARM WELCOME

Earlier this month, in one of his first actions on science, Macron launched a programme to attract leading climate scientists to work in France, offering 4-year grants of up to €1.5 million (US\$1.7 million) for senior scientists and up to €1 million for younger researchers. The move came in response to US President Donald Trump's announcement that he would withdraw his country from the Paris climate accord.

"Beyond his call for attracting scientists, Macron has shown a deep interest for climate issues," says Jouzel. A particularly hopeful sign for Jouzel was last month's appointment of Nicolas Hulot, an environmental activist and former nature-documentary presenter, as head of a powerful ministry overseeing energy and the environment.

Some scientists also cheered last week when Macron launched the French Tech Visa, a four-year, renewable, fast-track residence permit for entrepreneurs, innovators and investors. That sent an important signal of increased international openness to top talent, says Wunsch-Vincent, adding that Macron is boosting France's image as a good place to do research and create start-ups.

More generally, Macron wants to foster an entrepreneurial environment by reducing the costs of doing business, simplifying bureaucracy and making labour laws more flexible — things that some of his predecessors have attempted, but with limited success. He has also said he wants to encourage the country's entrepreneurs to focus on sectors such as robotics, artificial intelligence and green technology, which he sees as the industries of the future. He has announced a €10-billion state fund to invest in start-ups, and a €50-billion stimulus package to train young people and modernize agriculture, health care, transport and infrastructure.

Wunsch-Vincent cautions, however, that it will be several months before it becomes clearer how the various pledges will pan out, and how well they will be implemented.

Macron has admitted that the country hasn't always had the best reputation as a place for nimble innovation, but he argued that this was changing. "I want France to be a 'start-up nation,'" he said last week.

"I hope he will not disappoint the hopes he has raised," says Jouzel, "in particular in the area of jobs." ■



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The name of the 'Napoleon' oak commemorates French troops' march through Lausanne, Switzerland.

PLANT BIOLOGY

Old oak's youthful genome revealed

DNA of 234-year-old tree has surprisingly few mutations, suggesting that plants protect their stem cells.

BY HEIDI LEDFORD

The towering 234-year-old 'Napoleon' oak on the campus of the University of Lausanne in Switzerland has weathered storms both meteorological and political. The tree was young when Napoleon's troops passed through town in 1800, and it has grown into a majestic city landmark. But through it all, its genome has remained surprisingly unchanged.

Researchers at the university discovered this unexpected stability after sequencing the genome in different branches of the tree. Their work — posted on 13 June as a bioRxiv preprint, which has not been peer reviewed — meshes with a growing body of evidence that plants are able to shield their stem cells from

mutations¹. The practice may be valuable for sustaining their health over a lifespan that can reach hundreds of years.

"If you just accumulate more and more mutations, you would eventually die of mutational meltdown," says Cris Kuhlemeier, a developmental biologist at the University of Berne in Switzerland.

Each time a cell divides, mutations can arise because of errors made while copying the genome. Animals shield their reproductive cells from these mutations by isolating them early in development. These cells, called the germ line, then follow a different developmental path, and typically have a low rate of cell division.

But plants do not have a dedicated germ line: the cluster of stem cells that gives rise to the

reproductive parts of flowers also generates plant stems and leaves. Because of this, scientists thought that the stem cells would accumulate many mutations, and that the DNA of newer branches at the top of a long-lived tree would be remarkably different from the lower branches.

Plant biologist Philippe Reymond and his team at the University of Lausanne decided to test this using the university's prized oak tree. They sequenced the genomes of leaves on lower, older branches and upper, younger ones, and tallied the number of single-letter changes they found in the tree's DNA. (Reymond declined to be interviewed by *Nature* because the paper is currently under review at a scientific journal.)

The team found that the number of mutations was much lower than would be expected based on calculations of the number of cell divisions that occurred between the lower branch and the higher one.

"It's a tantalizing study," says Daniel Schoen, a plant evolutionary biologist at McGill University in Montreal, Canada. "It touches on something that was simmering always in the back of the minds of plant biologists."

It is too soon to say how general this phenomenon will be in plants, cautions Karel Říha, a plant geneticist at the Central European Institute of Technology in Brno, Czech Republic. The researchers also looked only at single-letter changes to the sequence and did not evaluate other kinds of mutation, such as deleted DNA.

Mao-Lun Weng, a plant evolutionary biologist at South Dakota State University in Brookings, notes that the team used a stringing filter to weed out background noise in the sequencing data, and so may have inadvertently missed some mutations.

But Říha and Weng are quick to note that the results are in line with two studies published last year. In the first², led by Kuhlemeier, researchers tracked individual stem-cell divisions in the growth region of plants called the meristem. They found that in tomato and thale cress (*Arabidopsis*), the meristem contains a set of three or four cells that divide much less often than the other cells in the region. The other study³, led by Říha, also found few mutations between old and new leaves in thale cress.

A clearer picture of plant development could help breeders as they increasingly focus on long-lived, perennial plants, says Schoen. "If, as plants age, there is this mutation accumulation that could impact vigour, we would want to know about it," he says. "We need more information of this type." ■

1. Sarkar, N. *et al.* Preprint at bioRxiv <http://dx.doi.org/10.1101/149203> (2017).
2. Burian, A., Barbier de Reuille, P. & Kuhlemeier, C. *Curr. Biol.* **26**, 1385–1394 (2016).
3. Watson, J. M. *et al.* *Proc. Natl Acad. Sci. USA* **113**, 12226–12231 (2016).

GENOMICS

BGI makes stock-market debut

China's sequencing pioneer bets on precision medicine.

BY DAVID CYRANOSKI

China's genomics giant BGI, once the world leader in DNA sequencing for basic science, is going public — capping its dramatic transformation into a biomedical firm with a focus on reproductive health.

A financial prospectus document to support the initial public offering (IPO) details how BGI has moved into more-profitable pursuits, such as prenatal genetic testing, in China's expanding medical market. The shift is also in line with the Chinese government's drive to promote precision medicine, an effort to use the reams of genomic and other medical data being created to tailor treatments.

BGI is currently working out the details of the IPO, which was years in the making and approved by China's financial regulators in late May. The IPO is expected within a month, and the firm hopes to raise 1.7 billion yuan (US\$250 million).

As the first genomics company to be listed in China, BGI will be a pioneer in the country's precision-medicine market, which is estimated to be worth 20 billion yuan by 2020. "It's a milestone for both BGI and the field," says Ruiqiang Li, who used to work for BGI and is now chief executive of a competing genomics firm, Beijing-based Novogene, which Li hopes to take public.

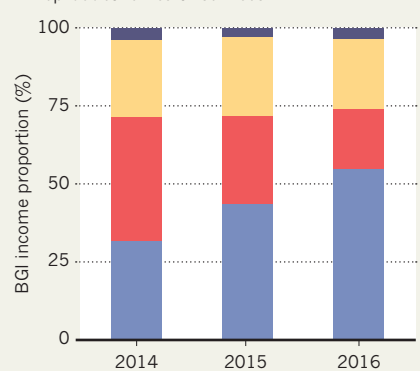
BGI was established in 1999 as the Beijing Genomics Institute, and was the force behind China's contribution to the Human Genome Project — it sequenced a small, but symbolic, 1% of the genome. Over the next decade, it produced a series of high-profile publications, including the genomes of rice, the giant panda and more than 1,000 species of gut bacteria. In 2010 — now based in Shenzhen and known simply as BGI — the company purchased 128 of the world's most-advanced genome-sequencing machines. Overnight, it became the industry's most prolific player. The number of studies based on BGI-sequenced genomes jumped from a handful to hundreds per year.

But that number has plateaued, and it looks set to drop this year. According to the prospectus, BGI's income from research-driven sequencing now accounts for less than 20% of its business (see 'Focus on health'). Reproductive-health screening brings in most of the firm's income.

FOCUS ON HEALTH

BGI now makes most of its money from reproductive-health services, rather than from sequencing genomes for research.

- Pharmaceutical research services
- Complex-disease services
- Basic-research services
- Reproductive-health services



SOURCE: BGI IPO PROSPECTUS

BGI would not comment on its operations, citing a "quiet" period mandated by the financial regulator before its stock-market debut. But its prospectus says that the move away from research-based sequencing is the result of the falling price of sequencing machines, which has allowed research institutes to set up their own facilities. And competition has intensified from companies such as Novogene, which says it has the largest sequencing capacity in the world.

"This shift seems to be market driven," says Dorret Boomsma of the VU University Amsterdam, who has used BGI sequences in studies of Dutch twins. BGI also suffered after the departure of its chief executive Jun Wang, who spearheaded many of BGI's research projects, but left in 2015 to start his own company.

Clinical sequencing in China, however, is booming, fuelled by the country's growing middle class and expanding health-care system. BGI has nearly 50% of the prenatal screening market in China.

With the money raised from its IPO, the firm hopes to improve its reproductive and cancer-diagnosis technologies. Other sequencing companies will be watching closely to see how BGI fares in the nascent market. "We don't know the level of interest from investors. The industry is still relatively small, but it's fast growing and has a lot of potential," says Li. ■