



Litigant Nathan Baring speaks during a meeting of the US Senate Climate Change Task Force.

CLIMATE LAWSUITS BREAK NEW GROUND TO PROTECT THE PLANET

Despite recent defeats, activists are optimistic that courts will provide relief from climate change.

By Giuliana Viglione

Twenty-year-old Nathan Baring is a third-generation Alaskan. Within his lifetime, he has seen winters shorten, cod fisheries collapse and cultural traditions suffer. He grieves for an Arctic that is disappearing before his eyes. “There is a very distinct loss of place here,” he says.

Baring decided to take action. He is one of 21 young plaintiffs who, in 2015, filed a lawsuit seeking to force the US government to reduce greenhouse-gas emissions. A federal appeals court dismissed the case, known as *Juliana v. United States*, in January.

But other attempts to fight climate change in the courts have been more successful. Two weeks ago, the UK Court of Appeal blocked plans to build a third runway at Heathrow Airport, saying that allowing the expansion would violate the country’s obligations to the Paris climate agreement.

Such decisions are inspiring and instructing activists and municipalities around the world. But as litigants fight scores of such cases, one thing is clear. “There is no silver litigation bullet for climate change,” says Michael Gerrard, director of the Sabin Center for

Climate Change Law at Columbia University in New York City.

On 18 February, the International Bar Association released a model for how to litigate climate change, laying out legal arguments and precedents that might help future plaintiffs.

What is likely to succeed seems to vary around the world. And as plaintiffs learn from their experiences in the courts, they are adjusting their tactics. The Heathrow case is the first

“There is no silver litigation bullet for climate change.”

major ruling based on the Paris agreement and could spur more suits that rely on those obligations. In other parts of the world, plaintiffs are increasingly focusing on seeking damages from polluters themselves.

The *Juliana* case is one of more than two dozen brought around the world on the basis of ‘public trust’ arguments, which say that the state has a duty to protect public resources from harm. Such arguments are closely linked to the idea that the fundamental right to life

is inextricably tied to a healthy environment.

Although the US court found that the plaintiffs had been harmed by the government’s inaction on climate change, the judges ultimately ruled that it was not within the court’s power to legislate climate policy.

But outside the United States, the human-rights approach is the legal strategy that has had the most success in forcing governments’ hands, says John Knox, an expert on international environmental law at Wake Forest University in Winston-Salem, North Carolina.

In *Urgenda Foundation v. State of the Netherlands*, a case brought in 2015 by an environmental group and nearly 900 Dutch citizens, the Dutch supreme court mandated that the government achieve a 25% reduction in greenhouse-gas emissions from 1990 levels by the end of 2020 to protect its citizens from the harms of a warming climate system.

And in *Demanda Generaciones Futuras v. Minambiente*, Colombia’s Supreme Court ordered the government to implement protective measures to halt deforestation in the Amazon – that case was brought by 25 young Colombians. Like *Juliana*, both cases rested on the idea that the right to life is endangered by threats to the environment.

Their success suggests that we can expect to see more suits brought by citizens against their governments, says Knox. Meanwhile, climate activists are watching closely to see how these governments comply with the court-ordered actions.

Damage limitation

In the United States, the scope of *Juliana* – which sought to force the US government to not only stop permitting and subsidizing fossil-fuel use, but also implement a plan for reducing atmospheric carbon dioxide levels – meant it was “always going to be a long shot”, says Ann Carlson, who studies environmental law at the University of California, Los Angeles. And given the increasingly conservative make-up of many US federal courts, Carlson thinks it is unlikely that future cases based on similar arguments will succeed.

Instead, Gerrard and Carlson expect more US activists and municipalities to pivot from targeting the government to suing the producers of emissions themselves. This strategy is seen as more pragmatic because cash penalties can, in some cases, be used for climate mitigation.

In *County of San Mateo v. Chevron Corp.*, several Californian cities and counties are seeking funds from major fossil-fuel corporations to fund infrastructure for adaptation to sea-level rise. Oral arguments in the latest appeal were heard on 5 February, but a ruling has yet to be handed down. Several other individuals and localities, including the state of Massachusetts, are currently suing ExxonMobil and other companies for allegedly deceiving

MARK WILSON/GETTY

consumers about the risks of fossil-fuel use.

Similar arguments for compensation are also being made outside the United States. In November 2015, a Peruvian farmer named Saúl Lliuya brought a case in German courts against the German utilities company RWE, the largest emitter of CO₂ in the European Union.

Lliuya, who lives near a glacial lake, alleges that RWE's emissions are partially responsible for the dangerously high water levels seen at the lake as nearby glaciers have melted. He is seeking 0.47% of the costs of flood-protection measures for his town, equal to RWE's proportion of global CO₂ emissions from 1751 to 2010.

The case was initially dismissed, but an

appeals court has since ruled that Lliuya's complaint was admissible, and the court has ordered the parties to submit expert evidence – the first time such a case has moved to the evidentiary stage. Gerrard says a victory could spur similar lawsuits around the world.

Although the recent ruling in *Juliana* was disappointing, the plaintiffs say that they are heartened by the court's finding that they had been harmed by the government's inaction on climate change. They are now preparing to appeal, and are optimistic that they will get a chance to argue their case in front of a jury. "We have many paths forward," Baring says. "This is certainly not the end of the road for us."

CRISPR TREATMENT INSERTED DIRECTLY INTO BODY FOR THE FIRST TIME

Experiment tests a gene-editing therapy for a hereditary blindness disorder.

By Heidi Ledford

A person with a genetic condition that causes blindness has become the first to receive a CRISPR–Cas9 gene therapy administered directly into their body.

The treatment is part of a landmark clinical trial to test the ability of CRISPR–Cas9 gene-editing techniques to remove

mutations that cause a rare condition called Leber's congenital amaurosis 10 (LCA10). No treatment is currently available for the disease, which is a leading cause of blindness in childhood.

For the latest trial, the components of the gene-editing system – encoded in the genome of a virus – are injected directly into the eye, near photoreceptor cells. By contrast, previous CRISPR–Cas9 clinical trials have used

the technique to edit the genomes of cells that have been removed from the body. The material is then infused back into the patient.

It's a significant jump from treating cells in a dish, says Fyodor Urnov, who studies genome editing at the University of California, Berkeley. "It is akin to space flight versus a regular plane trip," he says. "The technical challenges, and inherent safety concerns, are much greater."

"It's an exciting time," adds Mark Pennesi, a specialist in inherited retinal diseases at Oregon Health & Science University in Portland. Pennesi is collaborating with the pharmaceutical companies Editas Medicine of Cambridge, Massachusetts, and Allergan of Dublin to conduct the trial, which has been named BRILLIANCE.

Mutation eradication

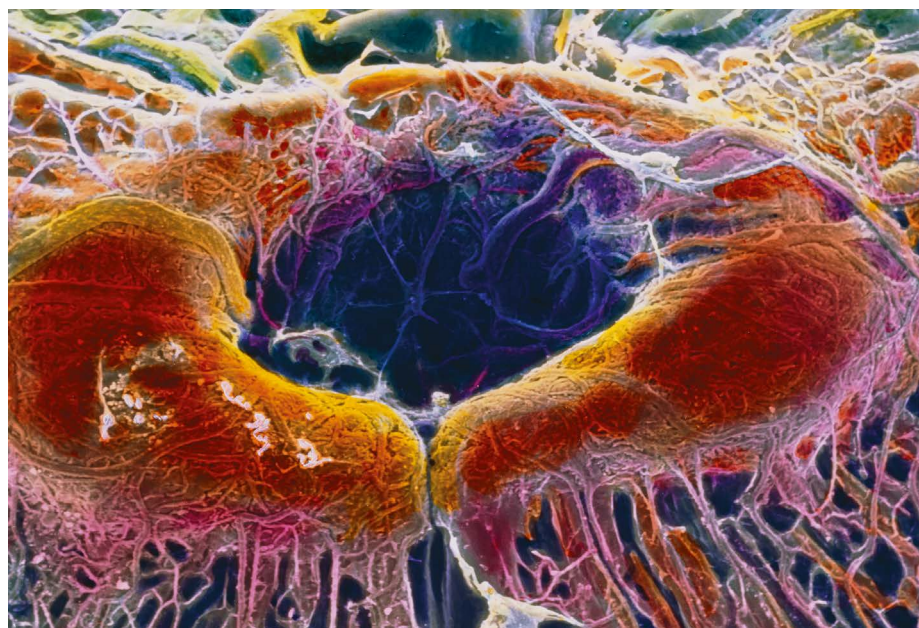
This is not the first time gene editing has been tried in the body: an older gene-editing system, called zinc-finger nucleases, has already been administered directly into people participating in clinical trials. Sangamo Therapeutics of Brisbane, California, has tested a zinc-finger-based treatment for a metabolic condition called Hunter's syndrome. The technique inserts a healthy copy of the affected gene into a specific location in the genome of liver cells. Although it seems to be safe, early results suggest it might do little to ease the symptoms of Hunter's syndrome.

But the BRILLIANCE trial is the first to deploy the popular CRISPR–Cas9 technique – which has been hailed for its versatility and ease of design – directly in the body. In BRILLIANCE, gene editing is used to delete a mutation in the gene *CEP290* that is responsible for LCA10.

The condition is a particularly attractive target for a gene-editing approach. Conventional gene therapies use a virus to insert a healthy copy of the mutated gene into affected cells. But *CEP290* is too large to slip the entire gene into a viral genome, says Artur Cideciyan, who studies retinal diseases at the University of Pennsylvania in Philadelphia.

And although mutations in *CEP290* disable light-sensing cells called photoreceptors in the retina, the cells are still present and alive in people with LCA10. "The hope is that you can reactivate those cells," says Pennesi. "This is one of the few diseases where we think you could actually get an improvement in vision."

Early results from another therapy suggest that this might be the case. Cideciyan has teamed up with ProQR of Leiden, the Netherlands, to treat people with LCA10 using an experimental treatment called sepfarsen. Early results suggest that sepfarsen, which uses a technique called antisense therapy to correct an LCA10-causing mutation in RNA made from the *CEP290* gene, can improve vision in people with LCA10.



The human retina. A CRISPR therapy has been inserted directly into a person's eye.